# INVERTER

# A800

# FR-A860 (600V CLASS SPECIFICATION INVERTER) INSTRUCTION MANUAL (STARTUP)

## FR-A860-00027-00450-N6
## FR-A860-00680-04420

Thank you for choosing this Mitsubishi Electric Inverter.
This Instruction Manual and the enclosed CD-ROM give handling information and precautions for use of this product.
Do not use this product until you have a full knowledge of the equipment, safety information and instructions.
Please forward this Instruction Manual and the enclosed CD-ROM to the end user.

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A800

**This Instruction Manual provides handling information and precautions for use of the equipment.**
**Please forward this Instruction Manual to the end user.**

**Safety Instructions**

**Do not attempt to install, operate, maintain or inspect the product until you have read through this Instruction Manual and supplementary documents carefully and can use the equipment correctly. Do not use this product until you have a full knowledge of this product mechanism, safety information and instructions.**
**Installation, operation, maintenance and inspection must be performed by qualified personnel. Here, qualified personnel means personnel who meets all the conditions below.**
- **A person who took a proper engineering training. Such training may be available at your local Mitsubishi Electric office. Contact your local sales office for schedules and locations.**
- **A person who can access operating manuals for the protective devices (e.g. light curtain) connected to the safety control system. A person who has read and familiarized himself/herself with the manuals.**

**In this Instruction Manual, the safety instruction levels are classified into "WARNING" and "CAUTION"**

| | |
|---|---|
| ⚠WARNING | **Incorrect handling may cause hazardous conditions, resulting in death or severe injury.** |
| ⚠CAUTION | **Incorrect handling may cause hazardous conditions, resulting in medium or slight injury, or may cause only material damage.** |

**Note that even the ⚠CAUTION level may even lead to a serious consequence according to conditions. Be sure to follow the instructions of both levels as they are critical to personal safety.**

### ◆ Electric Shock Prevention

**⚠WARNING**

- Do not remove the front cover or the wiring cover while the power of this product is ON, and do not run this product with the front cover or the wiring cover removed as the exposed high voltage terminals or the charging part of the circuitry can be touched. Otherwise you may get an electric shock.
- Even if power is OFF, do not remove the front cover except for wiring or periodic inspection as the inside of this product is charged. Otherwise you may get an electric shock.
- Before wiring or inspection, the power lamp must be switched OFF. Any person who is involved in wiring or inspection shall wait for at least 10 minutes after the power supply has been switched OFF and check that there are no residual voltage using a tester or the like. The capacitor is charged with high voltage for some time after power OFF, and it is dangerous.
- This product must be earthed (grounded). Earthing (grounding) must conform to the requirements of national and local safety regulations and electrical code (NEC section 250, IEC 61140 class 1 and other applicable standards).
- Any person who is involved in wiring or inspection of this product shall be fully competent to do the work.
- The inverter must be installed before wiring. Otherwise you may get an electric shock or be injured.
- Do not touch the setting dial or keys with wed hands. Doing so may cause an electric shock.
- Do not subject the cables to scratches, excessive stress, heavy loads or pinching. Doing so may cause an electric shock.
- Do not change the cooling fan while power is ON as it is dangerous.
- Do not touch the printed circuit board or handle the cables with wet hands. Doing so may cause an electric shock.
- Never touch the motor terminals, etc. right after powering OFF as the DC voltage is applied to the motor for 1 second at powering OFF if the main circuit capacitor capacity is measured. Doing so may cause an electric shock.
- Before wiring or inspection for a PM motor, confirm that the PM motor is stopped as a PM motor is a synchronous motor with high-performance magnets embedded inside and high-voltage is generated at the motor terminals while the motor is running even after the power of this product is turned OFF. In an application, such as fan and blower, that the motor may be driven by the load, connect a low-voltage manual contactor at this product output side and keep it open during wiring and inspection of this product. Otherwise you may get an electric shock.

### ◆ Fire Prevention

**⚠CAUTION**

- Inverter must be installed on a nonflammable wall without holes in it so that its components cannot be touched from behind. Installing it to or near flammable material may cause a fire.
- If the inverter becomes faulty, the inverter power must be switched OFF. A continuous flow of large current may cause a fire.
- When using a brake resistor, a sequence that will turn OFF power when a fault signal is output must be configured. Otherwise the brake resistor may excessively overheat due to damage of the brake transistor and such, causing a fire.
- Do not connect a resistor directly to the DC terminals P/+ and N/-. Doing so could cause a fire.
- Be sure to perform daily and periodic inspections as specified in the Instruction Manual (Detailed). There is a possibility of explosion, damage, or fire if this product is used without inspection.

### ◆ Injury Prevention

**⚠CAUTION**

- The voltage applied to each terminal must be the ones specified in the Instruction Manual (Detailed). Otherwise an explosion or damage may occur.
- The cables must be connected to the correct terminals. Otherwise an explosion or damage may occur.
- The polarity (+ and -) must be correct. Otherwise an explosion or damage may occur.
- While power is ON or for some time after power-OFF, do not touch the inverter as it will be extremely hot. Touching these devices may cause burns.

### ◆ Additional Instructions

**The following instructions must be also followed. If the product is handled incorrectly, it may cause unexpected fault, an injury, or an electric shock.**

**⚠CAUTION**

**Transportation and installation**
- To prevent injury, wear cut-resistant gloves when opening packaging with sharp tools.
- Use proper lifting techniques or a trolley when carrying products. Failure to do so may lead to injuries.
- Do not stand or rest heavy objects on the product.
- Do not stack the boxes containing inverters higher than the number recommended.
- When carrying the inverter, do not hold it by the front cover. It may fall or break.
- During installation, caution must be taken not to drop the inverter as doing so may cause injuries.
- The product must be installed on a surface that withstands the weight of the inverter.
- Do not install the product on a hot surface.
- Ensure the mounting orientation of this product is correct.
- Ensure this product is mounted securely in its enclosure.
- Do not install or operate the inverter if it is damaged or has parts missing.
- Foreign conductive objects must be prevented from entering the inverter. That includes screws and metal fragments or other flammable substance such as oil.
- As the inverter is a precision instrument, do not drop or subject it to impact.
- For the FR-A860-00090 or lower, the surrounding air temperature must be -10 to +40°C for the LD, ND, or HD rating (-10 to +30°C for the SLD rating) (non-freezing). Otherwise the inverter may be damaged.
- For the FR-A860-00170 to 01080, the surrounding air temperature must be -10 to +40°C (non-freezing). Otherwise the inverter may be damaged.
- For the FR-A860-01440 or higher, the surrounding air temperature must be -10 to +50°C for the LD or ND rating (-10 to +40°C for the SLD or HD rating) (non-freezing). Otherwise the inverter may be damaged.
- The ambient humidity must be 95%RH or less (non-condensing). Otherwise the inverter may be damaged. (Refer to page 5 for details.)
- The storage temperature (applicable for a short time, e.g. during transit) must be between -20 and +65°C. Otherwise the inverter may be damaged.
- The inverter must be used indoors (without corrosive gas, flammable gas, oil mist, dust and dirt etc.) Otherwise the inverter may be damaged.
- Do not use this product at an altitude above 2500 m. Vibration should not exceed 5.9 $m/s^2$ *1 at 10 to 55 Hz in X, Y, and Z directions. Otherwise the inverter may be damaged. (For installation at an altitude above 1000 m, consider a 3% reduction in the rated current per 500 m increase in altitude.)
- If halogens (including fluorine, chlorine, bromine, and iodine) contained in fumigants for wood packages enter this product, the product may be damaged. Prevent the entry of fumigant residuals or use an alternative method such as heat disinfection. Note that sterilization or disinfection of wood packages should be performed before packing the product.
- To prevent a failure, do not use the inverter with a part or material containing halogen flame retardant including bromine.

**Wiring**
- Do not install a power factor correction capacitor, surge absorber, or radio noise filter on the output side of this product. These devices may overheat or burn out.
- The output terminals (terminals U, V, and W) must be connected to a motor correctly. Otherwise the motor will rotate inversely.
- Even with the power OFF, high voltage is still applied to the terminals U, V and W while the PM motor is running. Ensure the PM motor has stopped before carrying out any wiring.
- Never connect a PM motor to a commercial power supply. Connecting a commercial power supply to the input terminals (U, V, W) of a PM motor will burn it out. The PM motor must be connected with the output terminals (U, V, W) of this product.

**Test operation**
- Before starting operation, each parameter must be confirmed and adjusted. A failure to do so may cause some machines to make unexpected motions.

*1 2.9 $m/s^2$ or less for the FR-A860-02890 or higher.

## ⚠ WARNING

### Usage

- Stay away from the equipment when the retry function is set as it will restart suddenly after a trip.
- Depending on the function settings of this product, the product does not stop its output even when the STOP/RESET key on the operation panel is pressed. To prepare for it, provide a separate circuit and switch (to turn OFF the power of this product, or apply a mechanical brake, etc.) for an emergency stop.
- Be sure to turn OFF the start (STF/STR) signal before clearing the fault as this product will restart the motor suddenly after a fault is cleared.
- Do not use a PM motor for an application where the PM motor is driven by its load and runs at a speed higher than the maximum motor speed.
- Use this inverter only with three-phase induction motors or with a PM motor. Connection of any other electrical equipment to the inverter output may damage the equipment.
- Performing pre-excitation (LX signal and X13 signal) under torque control (Real sensorless vector control) may start the motor running at a low speed even when the start command (STF or STR) is not input. This product with the start command ON may also rotate the motor at a low speed when the speed limit value is set to zero. Confirm that the motor running will not cause any safety problems before performing pre-excitation.
- Do not modify the equipment.
- Do not perform parts removal which is not instructed in the Instruction Manual (Detailed). Doing so may lead to fault or damage of the product.

## ⚠ CAUTION

### Usage

- The electronic thermal relay function does not guarantee protection of the motor from overheating. It is recommended to install both an external thermal and PTC thermistor for overheat protection.
- Do not repeatedly start or stop this product with a magnetic contactor on its input side. Doing so may shorten the life of this product.
- The effect of electromagnetic interference must be reduced by using a noise filter or by other means. Otherwise nearby electronic equipment may be affected.
- Appropriate precautions must be taken to suppress harmonics. Otherwise power supply harmonics from the inverter may heat/damage the power factor correction capacitor and generator.
- To drive a 600 V class motor by this product, use an insulation-enhanced motor, or take measures to suppress surge voltage. Otherwise surge voltage, which is attributed to the length and thickness of wire, may occur at the motor terminals, causing the motor insulation to deteriorate.
- When parameter clear or all parameter clear is performed, the required parameters must be set again before starting operations because all parameters return to their initial values.
- This product can be easily set for high-speed operation. Before changing its setting, the performances of the motor and machine must be fully examined.
- This product's brake function cannot be used as a mechanical brake. Use a separate device instead.
- Perform an inspection and test operation of this product if it has been stored for a long period of time.
- Static electricity in your body must be discharged before you touch the product.
- Only one PM motor can be connected to an inverter.
- A PM motor must be used under PM sensorless vector control. Do not use a synchronous motor, induction motor, or synchronous induction motor.
- Do not connect a PM motor in the induction motor control settings (initial settings). Do not use an induction motor in the PM sensorless vector control settings. It will cause a failure.
- In the system with a PM motor, the inverter power must be turned ON before closing the contacts of the contactor at the output side.
- When the emergency drive function is enabled, the operation is continued or the retry operation (automatic reset and restart) is repeated even if a fault occurs, which may damage or burn this product and the motor. Before restarting the normal operation after the operation using the emergency drive function, make sure that this product and the motor have no fault.
- To maintain the security (confidentiality, integrity, and availability) of the inverter and the system against unauthorized access, DoS*2 attacks, computer viruses, and other cyberattacks from external devices via network, take appropriate measures such as firewalls, virtual private networks (VPNs), and antivirus solutions. We shall have no responsibility or liability for any problems involving inverter trouble and system trouble by DoS attacks, unauthorized access, computer viruses, and other cyberattacks.

### Emergency stop

- A safety backup such as an emergency brake must be provided for devices or equipment in a system to prevent hazardous conditions in case of failure of the inverter or an external device controlling the inverter.
- If the breaker installed on the input side of this product trips, check for wiring faults (short circuits etc.) and damage to internal parts of this product. Identify and remove the cause of the trip before resetting the tripped breaker and applying the power to the product again.
- When a protective function is activated, take an appropriate corrective action, then reset the inverter, and resume the operation.

### Maintenance, inspection and parts replacement

- Do not carry out a megger (insulation resistance) test on the control circuit of the inverter. It will cause a failure.

### Disposal

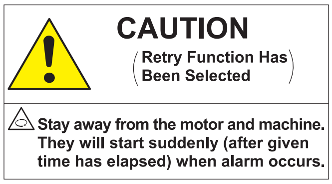
- The inverter must be treated as industrial waste.

*2 DoS: A denial-of-service (DoS) attack disrupts services by overloading systems or exploiting vulnerabilities, resulting in a denial-of-service (DoS) state.

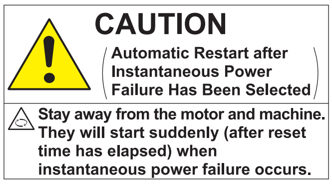
### Application of caution labels

Caution labels are used to ensure safety during use of Mitsubishi Electric inverters.
Apply the following labels to the inverter if the "retry function" and/or "automatic restart after instantaneous power failure" have been enabled.

- For the retry function

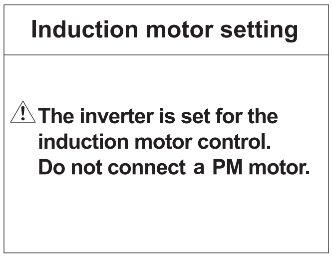


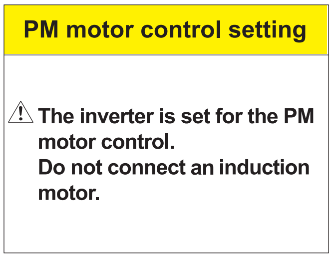

- For automatic restart after instantaneous power failure




### Application of motor control labels

Apply the following labels to the inverter to avoid connecting motors not intended for a particular motor control setting.




### General instruction

- For clarity, illustrations in this Instruction Manual may be drawn with covers or safety guards removed. Ensure all covers and safety guards are properly installed prior to starting operation. For details on the PM motor, refer to the Instruction Manual of the PM motor.

# MEMO

# 1 INVERTER INSTALLATION AND PRECAUTIONS

## ◆ Inverter model

- FR-A860-00450 or lower

FR - A8 6 0 - 00320 -1 -N6

| Symbol | Voltage class |
|---|---|
| 6 | 600 V class |

| Symbol | Description |
|---|---|
| 00027 to 00450 | Inverter SLD rated current (A) |

| Symbol | Circuit board coating (conforming to IEC60721-3-3 3C2/3S2) | Plated conductor | UL Type 1 certification |
|---|---|---|---|
| -N6 | With | Without | With |

- FR-A860-00680 or higher

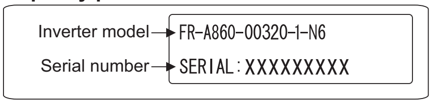
FR - A8 6 0 - 00680 -1 -60

| Symbol | Voltage class |
|---|---|
| 6 | 600 V class |

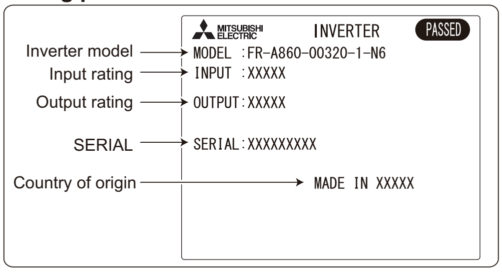
| Symbol | Description |
|---|---|
| 00680 to 04420 | Inverter SLD rated current (A) |

| Symbol | Circuit board coating (conforming to IEC60721-3-3 3C2/3S2) | Plated conductor |
|---|---|---|
| -60 | With | Without |
| -06 | With | With |

**Capacity plate**

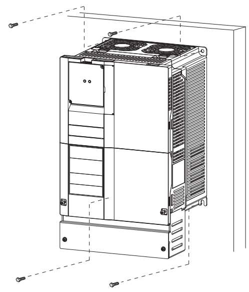



**Rating plate**



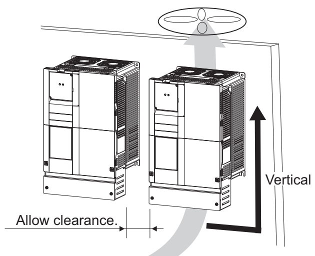

## ◆ Inverter placement

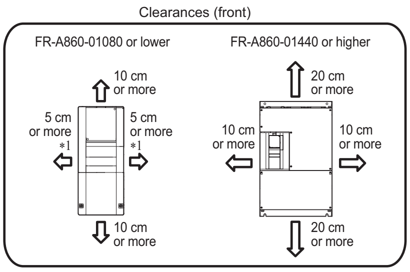
Installation on the enclosure

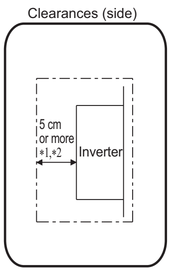


Fix six positions for the FR-A860-02890 or higher.

- Install the inverter on a strong surface securely with screws.
- Leave enough clearances and take cooling measures.
- Avoid places where the inverter is subjected to direct sunlight, high temperature and high humidity.
- Install the inverter on a nonflammable wall surface.
- When encasing multiple inverters, install them in parallel as a cooling measure.
- When designing or building an enclosure for the inverter, carefully consider influencing factors such as heat generation of the contained devices and the operating environment.



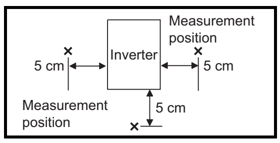




*1 For the FR-A860-00090 or lower, allow 1 cm or more clearance.
*2 For replacing the cooling fan of the FR-A860-02890 or higher, 30 cm of space is necessary in front of the inverter. Refer to the Instruction Manual (Detailed) for fan replacement.

## ◆ Installation environment

Before installation, confirm that the following environment conditions are met.

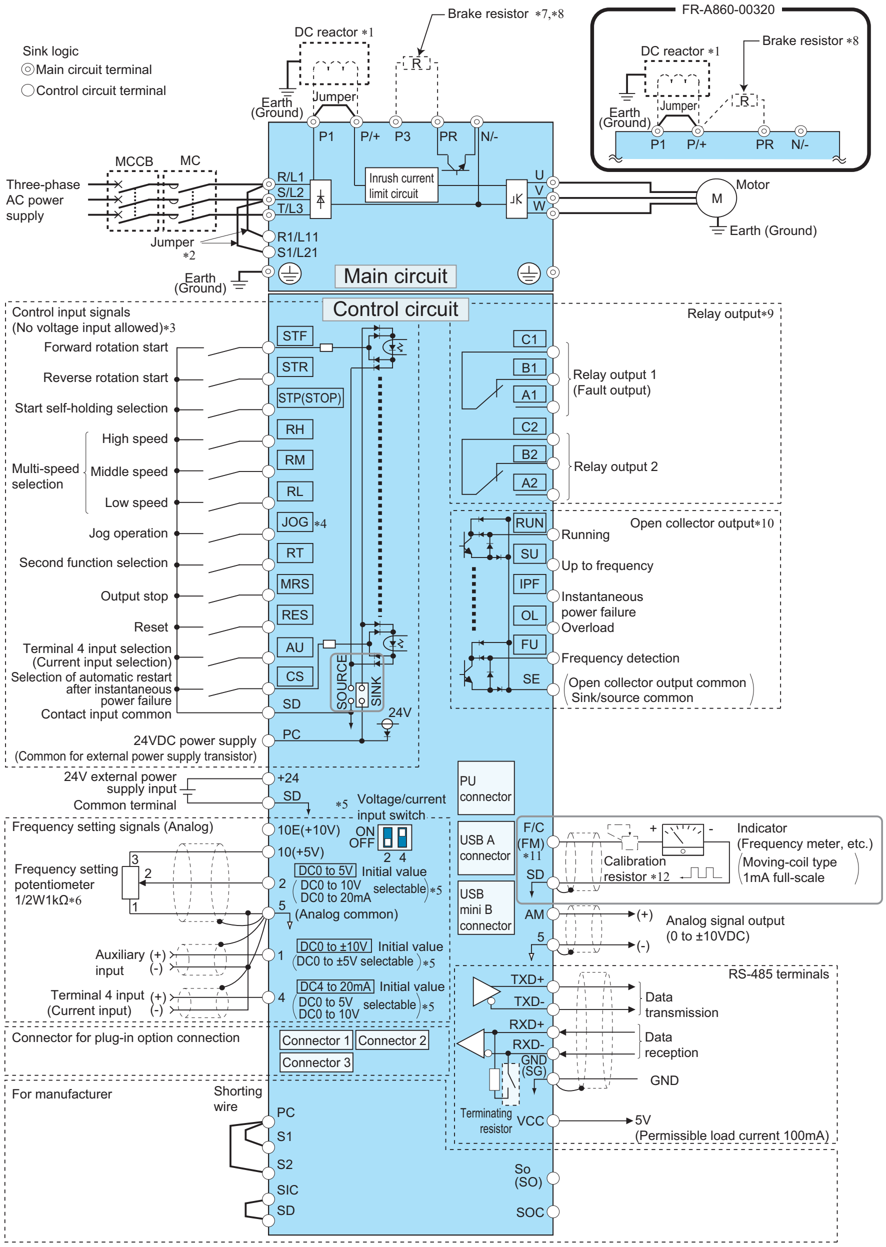
| Item | Description | | |
|---|---|---|---|
| Surrounding air temperature*4 | FR-A860-00090 or lower | -10°C to +40°C (non-freezing) (LD/ND/HD rating)<br>-10°C to +30°C (non-freezing) (SLD rating) | **Enclosure** *5<br> |
| | FR-A860-00170 to 01080 | -10°C to +40°C (non-freezing) | |
| | FR-A860-01440 or higher | -10°C to +50°C (non-freezing) (LD/ND rating)<br>-10°C to +40°C (non-freezing) (SLD/HD rating) | |
| Ambient humidity | 95% RH or less (non-condensing) | | |
| Storage temperature | -20 to +65°C*1 | | |
| Atmosphere | Indoors (free from corrosive gas, flammable gas, oil mist, dust and dirt) | | |
| Altitude | Maximum 2500 m*2 | | |
| Vibration | 5.9m/s$^2$ *3 or less at 10 to 55 Hz (directions of X, Y, Z axes) | | |



*1 Temperature applicable for a short time, e.g. in transit.
*2 For the installation at an altitude above 1000 m up to 2500 m, consider a 3% reduction in the rated current per 500 m increase in altitude.
*3 2.9 m/s$^2$ or less for the FR-A860-02890 or higher.
*4 Surrounding air temperature is a temperature measured at a measurement position in an enclosure.
Ambient temperature is a temperature outside an enclosure.
*5 The FR-A860-00680 or higher inverter is intended for installation in an enclosure.

# 2 WIRING

## 2.1 Terminal connection diagrams




*1 For the FR-A860-01440 or higher, and when a 75 kW or higher motor is used, always connect a DC reactor, which is available as an option. (To select a DC reactor, refer to the Instruction Manual (Detailed), and select one according to the applicable motor capacity.)
When connecting a DC reactor, if a jumper is installed across terminals P1 and P/+, remove the jumper before installing the DC reactor. (The jumper is not installed for the FR-A860-01440 or higher.)
*2 When using separate power supply for the control circuit, remove the jumper between R1/L11 and S1/L21.
*3 The function of these terminals can be changed with the input terminal assignment **(Pr.178 to Pr.189)**. (Refer to page 11.)
*4 Terminal JOG is also used as the pulse train input terminal. Use **Pr.291** to choose JOG or pulse.
*5 Terminal input specifications can be changed by analog input specification switchover **(Pr.73, Pr.267)**. To input a voltage, set the voltage/current input switch OFF. To input a current, set the voltage/current input switch ON. Terminals 10 and 2 are also used as a PTC input terminal. **(Pr.561)** (Refer to the Instruction Manual (Detailed).)
*6 It is recommended to use 2 W 1 kΩ when the frequency setting signal is changed frequently.
*7 A brake resistor is provided with the FR-A860-00090 or lower. Connect the provided brake resistor to terminals P3 and PR as required.
*8 Connect a brake resistor across terminals P3 (P/+) and PR. (Terminal PR is equipped in FR-A860-01080 or lower.) Install a thermal relay to prevent overheating and damage of discharging resistors. (Refer to the Instruction Manual (Detailed).)
*9 The function of these terminals can be changed with the output terminal assignment **(Pr.195, Pr.196)**. (Refer to page 11.)
*10 The function of these terminals can be changed with the output terminal assignment **(Pr.190 to Pr.194)**. (Refer to page 11.)
*11 Terminal F/C (FM) can be used to output pulse trains as open collector output by setting **Pr.291**.
*12 Not required when calibrating the scale with the operation panel (FR-LU08) or the parameter unit (FR-PU07).

**NOTE**

- To prevent a malfunction due to noise, keep the signal cables 10 cm or more away from the power cables. Also, separate the main circuit cables at the input side from the main circuit cables at the output side.
- After wiring, wire offcuts must not be left in the inverter. Wire offcuts can cause an alarm, failure or malfunction. Always keep the inverter clean. When drilling mounting holes in an enclosure etc., take caution not to allow chips and other foreign matter to enter the inverter.
- Set the voltage/current input switch correctly. Incorrect setting may cause a fault, failure or malfunction.
- The terminals S1, S2, SIC, So (SO), and SOC are for manufacturer setting. Do not connect anything to these. Doing so may cause an inverter failure.
  Do not remove the shorting wires across terminals S1 and PC, terminals S2 and PC, and terminals SIC and SD. Removing either shorting wire disables the inverter operation.

# 2.2 Main circuit terminals

## ◆ Cable gauge of main circuit terminals and earth (ground) terminals

Use an appropriate cable gauge to suppress the voltage drop to 2% or less.
If the wiring distance is long between the inverter and motor, the voltage drop in the main circuit will cause the motor torque to decrease especially at a low speed.
The following table indicates a selection example for the wiring length of 20 m.

- 600V class (575 V input power supply, 150% overload current rating for 1 minute)

| Applicable inverter model | Terminal screw size *2 | Tightening torque N•m | Crimp terminal | | | | Cable gauge *1 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | HIV cables, etc. ($mm^2$) | | | | AWG/MCM | | | |
| | | | R/L1, S/L2, T/L3 | U, V, W | P/+, P1 | Earthing (grounding) cable | R/L1, S/L2, T/L3 | U, V, W | P/+, P1 | Earthing (grounding) cable | R/L1, S/L2, T/L3 | U, V, W | P/+, P1 | Earthing (grounding) cable |
| FR-A860-00027 to 00090 | M4 | 1.5 | 2-4 | 2-4 | 2-4 | 2-4 | 2 | 2 | 2 | 2 | 14 | 14 | 14 | 14 |
| FR-A860-00170 | M4 | 1.5 | 3.5-4 | 2-4 | 3.5-4 | 3.5-4 | 3.5 | 2 | 3.5 | 3.5 | 12 | 14 | 10 | 12 |
| FR-A860-00320 | M5 | 2.5 | 5.5-5 | 5.5-5 | 8-5 | 5.5-5 | 5.5 | 5.5 | 8 | 5.5 | 10 | 10 | 8 | 10 |
| FR-A860-00450 | M6 | 4.4 | 14-6 | 14-6 | 14-6 | 14-6 | 14 | 14 | 14 | 14 | 6 | 6 | 4 | 6 |
| FR-A860-00680 | M8 | 7.8 | 22-8 | 22-8 | 22-8 | 22-8 | 22 | 22 | 22 | 22 | 4 | 4 | 2 | 4 |
| FR-A860-01080 | M8 | 7.8 | 38-8 | 38-8 | 38-8 | 22-8 | 38 | 38 | 38 | 22 | 2 | 2 | 1/0 | 4 |
| FR-A860-01440 | M10 | 26.5 | 60-10 | 60-10 | 60-10 | 38-10 | 60 | 60 | 60 | 38 | 2 | 2 | 1/0 | 1 |
| FR-A860-01670 | M10 | 26.5 | 60-10 | 60-10 | 60-10 | 38-10 | 60 | 60 | 60 | 38 | 1/0 | 1/0 | 2/0 | 1 |
| FR-A860-02430 | M10 | 26.5 | 60-10 | 60-10 | 60-10 | 38-10 | 60 | 60 | 60 | 38 | 2/0 | 2/0 | 3/0 | 1 |
| FR-A860-02890 | M12 (M10) | 46 | 80-12 | 80-12 | 80-12 | 38-10 | 80 | 80 | 80 | 38 | 4/0 | 250 | 300 | 1 |
| FR-A860-03360 | M12 (M10) | 46 | 100-12 | 100-12 | 125-12 | 38-10 | 100 | 100 | 125 | 38 | 250 | 300 | 2×2/0 | 1 |
| FR-A860-04420 | M12 (M10) | 46 | 125-12 | 125-12 | 150-12 | 60-10 | 125 | 125 | 150 | 60 | 2×2/0 | 2×3/0 | 2×4/0 | 1/0 |

*1 The cables used should be 75°C copper cables.
*2 The terminal screw size indicates the size of terminal screw for R/L1, S/L2, T/L3, U, V, W, PR, P/+, N/-, P1, P3, and the screw for earthing (grounding), and P/+ for option connection. A screw for earthing (grounding) of the FR-A860-02890 or higher is indicated in ( ).

The line voltage drop can be calculated by the following formula:

Line voltage drop [V] = $\sqrt{3}$ × wire resistance [mΩ/m] × wiring distance [m] × current [A] / 1000

Use a larger diameter cable when the wiring distance is long or when it is desired to decrease the voltage drop (torque reduction) in the low speed range.

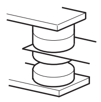
NOTE

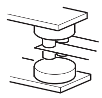
- Tighten the terminal screw to the specified torque. A screw that has been tightened too loosely can cause a short circuit or malfunction. A screw that has been tightened too tightly can cause a short circuit or malfunction due to the unit breakage.
- Use crimp terminals with insulation sleeves to wire the power supply and motor.

# 2.3 Control circuit terminal

## ◆ Wiring precautions

- It is recommended to use a cable of 0.3 to 0.75 $mm^2$ for connection to the control circuit terminals.
- The wiring length should be 30 m (200 m for terminal FM) at the maximum.
- Use two or more parallel micro-signal contacts or twin contacts to prevent contact faults when using contact inputs since the control circuit input signals are micro-currents.
- To suppress EMI, use shielded or twisted cables for the control circuit terminals and run them away from the main and power circuits (including the 200 V relay sequence circuit). For the cables connected to the control circuit terminals, connect their shields to the common terminal of the connected control circuit terminal. When connecting an external power supply to terminal PC, however, connect the shield of the power supply cable to the negative side of the external power supply. Do not directly earth (ground) the shield to the enclosure, etc.
- Always apply a voltage to the fault output terminals (A1, B1, C1, A2, B2, and C2) via a relay coil, lamp, etc.
- Do not connect any terminal SD on the inverter and the 0 V terminal of the external power supply (when the sink logic is selected).


Micro signal contacts


Twin contacts

## ◆ Wiring method

- Blade terminals commercially available (as of October 2020)

| Cable gauge ($mm^2$) | Ferrule terminal model | | | Manufacturer | Crimping tool name |
|---|---|---|---|---|---|
| | With insulation sleeve | Without insulation sleeve | For UL wire*1 | | |
| 0.3 | AI 0,34-10TQ | — | — | Phoenix Contact Co., Ltd. | CRIMPFOX 6 |
| 0.5 | AI 0,5-10WH | — | AI 0,5-10WH-GB | | |
| 0.75 | AI 0,75-10GY | A 0,75-10 | AI 0,75-10GY-GB | | |
| 1 | AI 1-10RD | A 1-10 | AI 1-10RD/1000GB | | |
| 1.25, 1.5 | AI 1,5-10BK | A 1,5-10 | AI 1,5-10BK/1000GB*2 | | |
| 0.75 (for two wires) | AI-TWIN 2×0,75-10GY | — | — | | |

*1 A ferrule terminal with an insulation sleeve compatible with the MTW wire which has a thick wire insulation.
*2 Applicable to terminals A1, B1, C1, A2, B2, and C2.

| Cable gauge ($mm^2$) | Blade terminal product number | Insulation cap product number | Manufacturer | Crimping tool product number |
|---|---|---|---|---|
| 0.3 to 0.75 | BT 0.75-11 | VC 0.75 | NICHIFU Co., Ltd. | NH 69 |

# 3 FAILSAFE SYSTEM WHICH USES THE INVERTER

When a fault is detected by the protective function, the protective function is activated and output a Fault (ALM) signal. However, a fault signal may not be output at an inverter's fault occurrence when the detection circuit or output circuit fails, etc. Although Mitsubishi Electric assures the best quality products, provide an interlock which uses inverter status output signals to prevent accidents such as damage to the machine when the inverter fails for some reason. Also, at the same time consider the system configuration where a failsafe from outside the inverter, without using the inverter, is enabled even if the inverter fails.

## ◆ Interlock method which uses the inverter status output signals

By combining the inverter output signals to provide an interlock as shown below, an inverter failure can be detected.

| Interlock method | Check method | Used signals | Refer to |
|---|---|---|---|
| Inverter protective function operation | Operation check of an alarm contact.<br>Circuit error detection by negative logic. | Fault (ALM) signal | Chapter 5 of the Instruction Manual (Detailed) |
| Inverter operating status | Operation ready signal check. | Inverter operation ready (RY) signal | Chapter 5 of the Instruction Manual (Detailed) |
| Inverter running status | Logic check of the start signal and running signal. | Start signal (STF signal, STR signal)<br>Inverter running (RUN) signal | Chapter 5 of the Instruction Manual (Detailed) |
| Inverter running status | Logic check of the start signal and output current. | Start signal (STF signal, STR signal)<br>Output current detection (Y12) signal | Chapter 5 of the Instruction Manual (Detailed) |

## ◆ Backup method outside the inverter

Even if the interlock is provided by the inverter status signal, enough failsafe is not ensured depending on the failure status of the inverter itself. For example, if an inverter CPU fails in a system interlocked with the inverter's fault, start, and RUN signals, no fault signal will be output and the RUN signal will be kept ON because the inverter CPU is down.

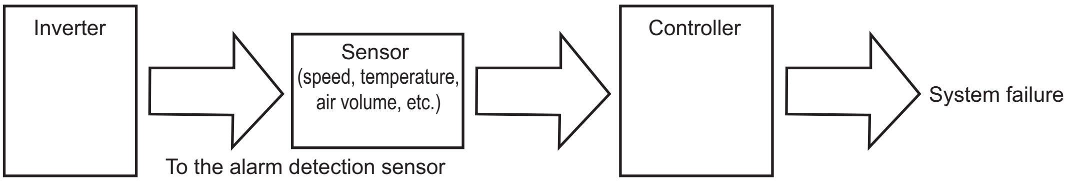
Provide a speed detector to detect the motor speed and current detector to detect the motor current and consider the backup system such as performing a check as below according to the level of importance of the system.

- Start signal and actual operation check

Check the motor running and motor current while the start signal is input to the inverter by comparing the start signal to the inverter and detected speed of the speed detector or detected current of the current detector. Note that the current is flowing through the motor while the motor coasts to stop, even after the inverter's start signal is turned OFF. For the logic check, configure a sequence considering the inverter's deceleration time. In addition, it is recommended to check the three-phase current when using the current detector.

- Command speed and actual operation check

Check for a gap between the actual speed and commanded speed by comparing the inverter's speed command and the speed detected by the speed detector.



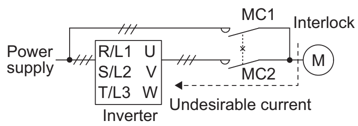

# 4 PRECAUTIONS FOR USE OF THE INVERTER

The FR-A800 series inverter is a highly reliable product, but incorrect peripheral circuit making or operation/handling method may shorten the product life or damage the product. Before starting operation, always recheck the following points.

- **Use crimp terminals with insulation sleeves to wire the power supply and the motor.**
- **Application of power to the output terminals (U, V, W) of the inverter will damage the inverter. Never perform such wiring.**
- **After wiring, wire offcuts must not be left in the inverter.**
  Wire offcuts can cause an alarm, failure or malfunction. Always keep the inverter clean.
  When drilling mounting holes in an enclosure etc., take caution not to allow chips and other foreign matter to enter the inverter.
- **Use an appropriate cable gauge to suppress the voltage drop to 2% or less.**
  If the wiring distance is long between the inverter and motor, a voltage drop in the main circuit will cause the motor torque to decrease especially during the output of a low frequency.
  Refer to **page 7** for the recommended cable gauge.
- **Keep the total wiring length within the specified length.**
  In long distance wiring, charging currents due to stray capacitance in the wiring may degrade the fast-response current limit operation or cause the equipment on the inverter's output side to malfunction. Pay attention to the total wiring length. (Refer to Chapter 2 of the Instruction Manual (Detailed).)
- **Electromagnetic wave interference**
  The input/output (main circuit) of the inverter includes high frequency components, which may interfere with the communication devices (such as AM radios) used near the inverter. In such case, install a noise filter.

- **Electrical corrosion of the bearing**
  When a motor is driven by the inverter, axial voltage is generated on the motor bearing, which may cause electrical corrosion of the bearing in rare cases depending on: condition of the grease used for the bearing, wiring, load, operating conditions of the motor, or specific inverter settings (high carrier frequency).
  Contact your sales representative to take appropriate countermeasures for the motor.
  The following shows examples of countermeasures for the inverter.
  - Decrease the carrier frequency.
  - Provide a common mode choke *1 on the output side of the inverter.

    *1 Recommended common mode choke: FT-3KM F series FINEMET® common mode choke cores manufactured by Hitachi Metals, Ltd.
    FINEMET is a registered trademark of Hitachi Metals, Ltd.
- **Do not install a power factor correction capacitor, surge suppressor or capacitor type filter on the inverter's output side.**
  Doing so will cause the inverter to trip or the capacitor and surge suppressor to be damaged. If any of the above devices is connected, immediately remove it.
- **For some short time after the power-OFF, a high voltage remains in the smoothing capacitor, and it is dangerous.**
  A smoothing capacitor holds high voltage some time after power-OFF. When accessing the inverter for inspection, wait for at least 10 minutes after the power supply has been switched OFF, and then make sure that the voltage across the main circuit terminals P/+ and N/- of the inverter is low enough using a tester, etc.
- **If the alarm lamp is flickered, turn OFF the 24 V external power supply before performing wiring.**
- **A short circuit or earth (ground) fault on the inverter's output side may damage the inverter module.**
  - Fully check the insulation resistance of the circuit prior to inverter operation since repeated short circuits caused by peripheral circuit inadequacy or an earth (ground) fault caused by wiring inadequacy or reduced motor insulation resistance may damage the inverter module.
  - Fully check the to-earth (ground) insulation and phase-to-phase insulation of the inverter's output side before power-ON.
    Especially for an old motor or use in hostile atmosphere, securely check the motor insulation resistance, etc.
- **Do not use the magnetic contactor (MC) on the inverter's input side to start/stop the inverter.**
  Since repeated inrush currents at power ON will shorten the life of the converter circuit (1,000,000 times for others), frequent starts and stops of the input side MC must be avoided. Turn ON/OFF the inverter's start signals (STF, STR) to run/stop the inverter. (Refer to page 6.)
- **Across terminals P3(P/+) and PR, connect only a brake resistor.**
  Do not connect a mechanical brake.
- **Do not apply a voltage higher than the permissible voltage to the inverter I/O signal circuits.**
  Application of a voltage higher than the permissible voltage to the inverter I/O signal circuits or opposite polarity may damage the I/O devices. Especially check the wiring to prevent the speed setting potentiometer from being connected incorrectly to short circuit terminals 10E and 5.
- **To use the commercial power supply during general-purpose motor operation, be sure to provide electrical and mechanical interlocks between the electronic bypass contactors MC1 and MC2.**
  When using a switching circuit as shown right, chattering due to mis-configured sequence or arc generated at switching may allow undesirable current to flow in and damage the inverter. Mis-wiring may also damage the inverter.
  (The commercial power supply operation is not available with vector control dedicated motors nor with PM motors.)




- **If the machine must not be restarted when power is restored after a power failure, provide an MC in the inverter's input side and also make up a sequence which will not switch ON the start signal.**
  If the start signal (start switch) remains ON after a power failure, the inverter will automatically restart as soon as the power is restored.
- **Vector control is available with an encoder-equipped motor. And such an encoder must be directly connected to a motor shaft without any backlash. (Real sensorless vector control does not require an encoder.)**
- **MC on the inverter's input side**
  On the inverter's input side, connect an MC for the following purposes. (For the selection, refer to Chapter 2 of the Instruction Manual (Detailed).)
  - To disconnect the inverter from the power supply at activation of a protective function or at malfunctioning of the driving system (emergency stop, etc.).
  - To prevent any accident due to an automatic restart at power restoration after an inverter stop made by a power failure.
  - To separate the inverter from the power supply to ensure safe maintenance and inspection work.

  If using an MC for emergency stop during operation, select an MC regarding the inverter input side current as JEM 1038-AC-3 class rated current.
- **Handling of the magnetic contactor on the inverter's output side**
  Switch the magnetic contactor between the inverter and motor only when both the inverter and motor are at a stop. When the magnetic contactor is turned ON while the inverter is operating, overcurrent protection of the inverter and such will activate. When providing MCs to use the commercial power supply during general-purpose motor operation, switch the MCs after both the inverter and motor stop.
  A PM motor is a synchronous motor with high-performance magnets embedded inside. High-voltage is generated at the motor terminals while the motor is running even after the inverter power is turned OFF. Before wiring or inspection, confirm that the motor is stopped. In an application, such as fan and blower, where the motor is driven by the load, a low-voltage manual contactor must be connected at the inverter's output side, and wiring and inspection must be performed while the contactor is open. Otherwise you may get an electric shock.
- **Countermeasures against inverter-generated EMI**
  If electromagnetic noise generated from the inverter causes the frequency setting signal to fluctuate and the motor rotation speed to be unstable when changing the motor speed with analog signals, the following countermeasures are effective.
  - Do not run the signal cables and power cables (inverter I/O cables) in parallel with each other and do not bundle them.
  - Run signal cables as far away as possible from power cables (inverter I/O cables).
  - Use shielded cables.
  - Install a ferrite core on the signal cable.
- **Instructions for overload operation**
  When performing frequent starts/stops by the inverter, rise/fall in the temperature of the transistor element of the inverter will repeat due to a repeated flow of large current, shortening the life from thermal fatigue. Since thermal fatigue is related to the amount of current, the life can be increased by reducing current at locked condition, starting current, etc. Reducing current may extend the service life but may also cause torque shortage, which leads to a start failure. Adding a margin to the current can eliminate such a condition. For a general-purpose motor, use an inverter of a higher capacity (up to 2 ranks). For an IPM motor, use an inverter and IPM motor of higher capacities.
- **Make sure that the specifications and rating match the system requirements.**

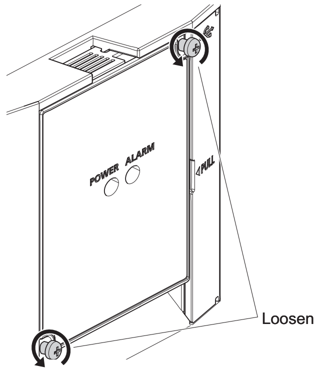
# 5 INVERTER FUNCTION SETTING

## 5.1 Operation panel (FR-LU08)

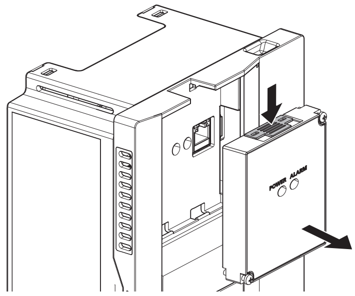
The operation panel can be used for setting the inverter parameters, monitoring various items, and checking fault indications.

### ◆ Removal and installation of the accessory cover

- Loosen the two fixing screws on the accessory cover.
  (These screws cannot be removed.)



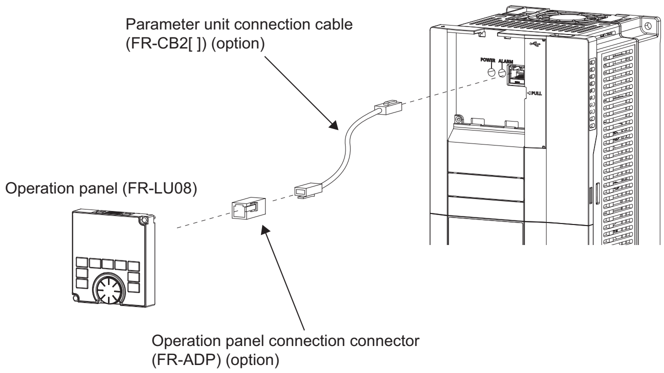

- Push the upper edge of the accessory cover and pull the accessory cover to remove.



- To install the accessory cover, fit it securely and tighten the screws. (Tightening torque: 0.40 to 0.45 N•m)

### ◆ Installing the operation panel on the enclosure surface

- Having an operation panel on the enclosure surface is convenient. With a connection cable, you can install the operation panel to the enclosure surface, and connect it to the inverter.
  Use the option FR-CB2[ ], or connectors and cables available on the market. (To install the operation panel, the optional connector (FR-ADP) is required.)
  Securely insert one end of the connection cable until the stoppers are fixed.




NOTE

- Refer to the following table when fabricating the cable on the user side. Keep the total cable length within 20 m.

| Name | Remarks |
|---|---|
| Communication cable | Cable compliant with EIA-568 (such as 10BASE-T cable) |

- For the details of the FR-LU08, refer to the FR-LU08 Instruction Manual.

# 5.2 Parameter list

For simple variable-speed operation of the inverter, the initial values of the parameters may be used as they are. Set the necessary parameters to meet the load and operational specifications. Parameter setting, change and check can be performed from the operation panel.

| Pr. | Name | Setting range | Initial value |
|---|---|---|---|
| 0*9 | Torque boost | 0 to 30% | 5/3/2/1%*1 |
| 1*9 | Maximum frequency | 0 to 120Hz | 120Hz*2<br>60Hz*3 |
| 2*9 | Minimum frequency | 0 to 120Hz | 0Hz |
| 3*9 | Base frequency | 0 to 590Hz | 60Hz |
| 4*9 | Multi-speed setting (high speed) | 0 to 590Hz | 60Hz |
| 5*9 | Multi-speed setting (middle speed) | 0 to 590Hz | 30Hz |
| 6*9 | Multi-speed setting (low speed) | 0 to 590Hz | 10Hz |
| 7*9 | Acceleration time | 0 to 3600s | 5s*4<br>15s*5 |
| 8*9 | Deceleration time | 0 to 3600s | 5s*4<br>15s*5 |
| 9*9 | Electronic thermal O/L relay | 0 to 500A*2<br>0 to 3600A*3 | Rated inverter current |
| 10 | DC injection brake operation frequency | 0 to 120Hz, 9999 | 3Hz |
| 11 | DC injection brake operation time | 0 to 10s, 8888 | 0.5s |
| 12 | DC injection brake operation voltage | 0 to 30% | 1% |
| 13 | Starting frequency | 0 to 60Hz | 0.5Hz |
| 14 | Load pattern selection | 0 to 5, 12 to 15 | 0 |
| 15*9 | Jog frequency | 0 to 590Hz | 5Hz |
| 16*9 | Jog acceleration/deceleration time | 0 to 3600s | 0.5s |
| 17 | MRS input selection | 0, 2, 4 | 0 |
| 18 | High speed maximum frequency | 0 to 590Hz | 120Hz*2<br>60Hz*3 |
| 19 | Base frequency voltage | 0 to 1000V, 8888, 9999 | 9999 |
| 20 | Acceleration/deceleration reference frequency | 1 to 590Hz | 60Hz |
| 21 | Acceleration/deceleration time increments | 0, 1 | 0 |
| 22 | Stall prevention operation level (Torque limit level) | 0 to 400% | 150% |
| 23 | Stall prevention operation level compensation factor at double speed | 0 to 200%, 9999 | 9999 |
| 24 to 27 | Multi-speed setting (4 speed to 7 speed) | 0 to 590Hz, 9999 | 9999 |
| 28 | Multi-speed input compensation selection | 0, 1 | 0 |
| 29 | Acceleration/deceleration pattern selection | 0 to 6 | 0 |
| 30 | Regenerative function selection | 0 to 2, 10, 11, 20, 21, 100 to 102, 110, 111, 120, 121 | 0 |
| 31 | Frequency jump 1A | 0 to 590Hz, 9999 | 9999 |
| 32 | Frequency jump 1B | | 9999 |
| 33 | Frequency jump 2A | | 9999 |
| 34 | Frequency jump 2B | | 9999 |
| 35 | Frequency jump 3A | | 9999 |
| 36 | Frequency jump 3B | | 9999 |
| 37 | Speed display | 0, 1 to 9998 | 0 |
| 41 | Up-to-frequency sensitivity | 0 to 100% | 10% |
| 42 | Output frequency detection | 0 to 590Hz | 6Hz |
| 43 | Output frequency detection for reverse rotation | 0 to 590Hz, 9999 | 9999 |
| 44 | Second acceleration/deceleration time | 0 to 3600s | 5s |
| 45 | Second deceleration time | 0 to 3600s, 9999 | 9999 |
| 46 | Second torque boost | 0 to 30%, 9999 | 9999 |
| 47 | Second V/F (base frequency) | 0 to 590Hz, 9999 | 9999 |
| 48 | Second stall prevention operation level | 0 to 400% | 150% |
| 49 | Second stall prevention operation frequency | 0 to 590Hz, 9999 | 0Hz |
| 50 | Second output frequency detection | 0 to 590Hz | 30Hz |

| Pr. | Name | Setting range | Initial value |
|---|---|---|---|
| 51 | Second electronic thermal O/L relay | 0 to 500A, 9999*2<br>0 to 3600A, 9999*3 | 9999 |
| 52 | Operation panel main monitor selection | 0, 5 to 14, 17 to 20, 22 to 36, 38 to 46, 50 to 57, 61, 62, 64, 67, 68, 71 to 75, 87 to 98, 100 | 0 |
| 54 | FM terminal function selection | 1 to 3, 5 to 14, 17, 18, 21, 24, 32 to 34, 36, 46, 50, 52, 53, 61, 62, 67, 70, 87 to 90, 92, 93, 95, 97, 98 | 1 |
| 55 | Frequency monitoring reference | 0 to 590Hz | 60Hz |
| 56 | Current monitoring reference | 0 to 500A*2<br>0 to 3600A*3 | Rated inverter current |
| 57 | Restart coasting time | 0, 0.1 to 30s, 9999 | 9999 |
| 58 | Restart cushion time | 0 to 60s | 1s |
| 59 | Remote function selection | 0 to 3, 11 to 13 | 0 |
| 60 | Energy saving control selection | 0, 4, 9 | 0 |
| 61 | Reference current | 0 to 500A, 9999*2<br>0 to 3600A, 9999*3 | 9999 |
| 62 | Reference value at acceleration | 0 to 400%, 9999 | 9999 |
| 63 | Reference value at deceleration | 0 to 400%, 9999 | 9999 |
| 64 | Starting frequency for elevator mode | 0 to 10Hz, 9999 | 9999 |
| 65 | Retry selection | 0 to 5 | 0 |
| 66 | Stall prevention operation reduction starting frequency | 0 to 590Hz | 60Hz |
| 67 | Number of retries at fault occurrence | 0 to 10, 101 to 110 | 0 |
| 68 | Retry waiting time | 0.1 to 600s | 1s |
| 69 | Retry count display erase | 0 | 0 |
| 70 | Special regenerative brake duty | 0 to 100% | 0% |
| 71 | Applied motor | 0 to 6, 13 to 16, 30, 33, 34, 8090, 8093, 8094, 9090, 9093, 9094 | 0 |
| 72 | PWM frequency selection | 0 to 15*2<br>0 to 6, 25*3 | 2 |
| 73 | Analog input selection | 0 to 7, 10 to 17 | 1 |
| 74 | Input filter time constant | 0 to 8 | 1 |
| 75 | Reset selection/disconnected PU detection/PU stop selection | 0 to 3, 14 to 17, 1000 to 1003, 1014 to 1017*2<br>0 to 3, 14 to 17, 100 to 103, 114 to 117, 1000 to 1003, 1014 to 1017, 1100 to 1103, 1114 to 1117*3 | 14 |
| 76 | Fault code output selection | 0 to 2 | 0 |
| 77 | Parameter write selection | 0 to 2 | 0 |
| 78 | Reverse rotation prevention selection | 0 to 2 | 0 |
| 79*9 | Operation mode selection | 0 to 4, 6, 7 | 0 |
| 80 | Motor capacity | 0.4 to 55kW, 9999*2<br>0 to 3600kW, 9999*3 | 9999 |
| 81 | Number of motor poles | 2, 4, 6, 8, 10, 12, 9999 | 9999 |
| 82 | Motor excitation current | 0 to 500A, 9999*2<br>0 to 3600A, 9999*3 | 9999 |
| 83 | Rated motor voltage | 0 to 1000V | 575V |
| 84 | Rated motor frequency | 10 to 400Hz, 9999 | 9999 |
| 85 | Excitation current break point | 0 to 400Hz, 9999 | 9999 |

| Pr. | Name | Setting range | Initial value |
|---|---|---|---|
| 86 | Excitation current low-speed scaling factor | 0 to 300%, 9999 | 9999 |
| 89 | Speed control gain (Advanced magnetic flux vector) | 0 to 200%, 9999 | 9999 |
| 90 | Motor constant (R1) | 0 to 50Ω, 9999*2<br>0 to 400mΩ, 9999*3 | 9999 |
| 91 | Motor constant (R2) | 0 to 50Ω, 9999*2<br>0 to 400mΩ, 9999*3 | 9999 |
| 92 | Motor constant (L1)/d-axis inductance (Ld) | 0 to 6000mH, 9999*2<br>0 to 400mH, 9999*3 | 9999 |
| 93 | Motor constant (L2)/q-axis inductance (Lq) | 0 to 6000mH, 9999*2<br>0 to 400mH, 9999*3 | 9999 |
| 94 | Motor constant (X) | 0 to 100%, 9999 | 9999 |
| 95 | Online auto tuning selection | 0 to 2 | 0 |
| 96 | Auto tuning setting/status | 0, 1, 11, 101 | 0 |
| 100 | V/F1 (first frequency) | 0 to 590Hz, 9999 | 9999 |
| 101 | V/F1 (first frequency voltage) | 0 to 1000V | 0V |
| 102 | V/F2 (second frequency) | 0 to 590Hz, 9999 | 9999 |
| 103 | V/F2 (second frequency voltage) | 0 to 1000V | 0V |
| 104 | V/F3 (third frequency) | 0 to 590Hz, 9999 | 9999 |
| 105 | V/F3 (third frequency voltage) | 0 to 1000V | 0V |
| 106 | V/F4 (fourth frequency) | 0 to 590Hz, 9999 | 9999 |
| 107 | V/F4 (fourth frequency voltage) | 0 to 1000V | 0V |
| 108 | V/F5 (fifth frequency) | 0 to 590Hz, 9999 | 9999 |
| 109 | V/F5 (fifth frequency voltage) | 0 to 1000V | 0V |
| 110 | Third acceleration/deceleration time | 0 to 3600s, 9999 | 9999 |
| 111 | Third deceleration time | 0 to 3600s, 9999 | 9999 |
| 112 | Third torque boost | 0 to 30%, 9999 | 9999 |
| 113 | Third V/F (base frequency) | 0 to 590Hz, 9999 | 9999 |
| 114 | Third stall prevention operation level | 0 to 400% | 150% |
| 115 | Third stall prevention operation frequency | 0 to 590Hz | 0Hz |
| 116 | Third output frequency detection | 0 to 590Hz | 60Hz |
| 117 | PU communication station number | 0 to 31 | 0 |
| 118 | PU communication speed | 48, 96, 192, 384, 576, 768, 1152 | 192 |
| 119 | PU communication stop bit length / data length | 0, 1, 10, 11 | 1 |
| 120 | PU communication parity check | 0 to 2 | 2 |
| 121 | Number of PU communication retries | 0 to 10, 9999 | 1 |
| 122 | PU communication check time interval | 0, 0.1 to 999.8s, 9999 | 9999 |
| 123 | PU communication waiting time setting | 0 to 150ms, 9999 | 9999 |
| 124 | PU communication CR/LF selection | 0 to 2 | 1 |
| 125*9 | Terminal 2 frequency setting gain frequency | 0 to 590Hz | 60Hz |
| 126*9 | Terminal 4 frequency setting gain frequency | 0 to 590Hz | 60Hz |
| 127 | PID control automatic switchover frequency | 0 to 590Hz, 9999 | 9999 |
| 128 | PID action selection | 0, 10, 11, 20, 21, 40 to 43, 50, 51, 60, 61, 70, 71, 80, 81, 90, 91, 100, 101, 1000, 1001, 1010, 1011, 2000, 2001, 2010, 2011 | 0 |
| 129 | PID proportional band | 0.1 to 1000%, 9999 | 100% |
| 130 | PID integral time | 0.1 to 3600s, 9999 | 1s |

| Pr. | Name | Setting range | Initial value |
|---|---|---|---|
| 131 | PID upper limit | 0 to 100%, 9999 | 9999 |
| 132 | PID lower limit | 0 to 100%, 9999 | 9999 |
| 133 | PID action set point | 0 to 100%, 9999 | 9999 |
| 134 | PID differential time | 0.01 to 10s, 9999 | 9999 |
| 135 | Electronic bypass sequence selection | 0, 1 | 0 |
| 136 | MC switchover interlock time | 0 to 100s | 1s |
| 137 | Start waiting time | 0 to 100s | 0.5s |
| 138 | Bypass selection at a fault | 0, 1 | 0 |
| 139 | Automatic switchover frequency from inverter to bypass operation | 0 to 60Hz, 9999 | 9999 |
| 140 | Backlash acceleration stopping frequency | 0 to 590Hz | 1Hz |
| 141 | Backlash acceleration stopping time | 0 to 360s | 0.5s |
| 142 | Backlash deceleration stopping frequency | 0 to 590Hz | 1Hz |
| 143 | Backlash deceleration stopping time | 0 to 360s | 0.5s |
| 144 | Speed setting switchover | 0, 2, 4, 6, 8, 10, 12, 102, 104, 106, 108, 110, 112 | 4 |
| 145 | PU display language selection | 0 to 7 | — |
| 147 | Acceleration/deceleration time switching frequency | 0 to 590Hz, 9999 | 9999 |
| 148 | Stall prevention level at 0 V input | 0 to 400% | 150% |
| 149 | Stall prevention level at 10 V input | 0 to 400% | 200% |
| 150 | Output current detection level | 0 to 400% | 150% |
| 151 | Output current detection signal delay time | 0 to 10s | 0s |
| 152 | Zero current detection level | 0 to 400% | 5% |
| 153 | Zero current detection time | 0 to 10s | 0.5s |
| 154 | Voltage reduction selection during stall prevention operation | 0, 1, 10, 11 | 1 |
| 155 | RT signal function validity condition selection | 0, 10 | 0 |
| 156 | Stall prevention operation selection | 0 to 31, 100, 101 | 0 |
| 157 | OL signal output timer | 0 to 25s, 9999 | 0s |
| 158 | AM terminal function selection | 1 to 3, 5 to 14, 17, 18, 21, 24, 32 to 34, 36, 46, 50, 52 to 54, 61, 62, 67, 70, 87 to 90, 91 to 98 | 1 |
| 159 | Automatic switchover frequency range from bypass to inverter operation | 0 to 10Hz, 9999 | 9999 |
| 160*9 | User group read selection | 0, 1, 9999 | 0 |
| 161 | Parameter for manufacturer setting. Do not set. | | |
| 162 | Automatic restart after instantaneous power failure selection | 0 to 3, 10 to 13, 1000 to 1003, 1010 to 1013 | 0 |
| 163 | First cushion time for restart | 0 to 20s | 0s |
| 164 | First cushion voltage for restart | 0 to 100% | 0% |
| 165 | Stall prevention operation level for restart | 0 to 400% | 150% |
| 166 | Output current detection signal retention time | 0 to 10s, 9999 | 0.1s |
| 167 | Output current detection operation selection | 0, 1, 10, 11 | 0 |
| 168, 169 | Parameter for manufacturer setting. Do not set. | | |
| 170 | Watt-hour meter clear | 0, 10, 9999 | 9999 |
| 171 | Operation hour meter clear | 0, 9999 | 9999 |
| 172 | User group registered display/batch clear | 9999, (0 to 16) | 0 |
| 173 | User group registration | 0 to 1999, 9999 | 9999 |
| 174 | User group clear | 0 to 1999, 9999 | 9999 |
| 178 | STF terminal function selection | 0 to 20, 22 to 28, 32, 37, 42 to 48, 50 to 53, 57 to 62, 64 to 74, 76 to 80, 84, 85, 87 to 89, 92 to 96, 128, 129, 9999*7 | 60 |
| 179 | STR terminal function selection | | 61 |
| 180 | RL terminal function selection | | 0 |
| 181 | RM terminal function selection | | 1 |

| Pr. | Name | Setting range | Initial value |
|---|---|---|---|
| 182 | RH terminal function selection | 0 to 20, 22 to 28, 32, 37, 42 to 48, 50 to 53, 57 to 62, 64 to 74, 76 to 80, 84, 85, 87 to 89, 92 to 96, 128, 129, 9999*7 | 2 |
| 183 | RT terminal function selection | | 3 |
| 184 | AU terminal function selection | | 4 |
| 185 | JOG terminal function selection | | 5 |
| 186 | CS terminal function selection | | 6 |
| 187 | MRS terminal function selection | | 24 |
| 188 | STOP terminal function selection | | 25 |
| 189 | RES terminal function selection | | 62 |
| 190 | RUN terminal function selection | 0 to 8, 10 to 20, 22, 25 to 28, 30 to 36, 38 to 57, 60, 61, 63 to 68, 70, 79, 80, 84, 85, 90 to 99, 100 to 108, 110 to 116, 120, 122, 125 to 128, 130 to 136, 138 to 157, 160, 161, 163 to 168, 170, 179, 180, 184, 185, 190 to 199, 200 to 208, 211 to 213, 247, 300 to 308, 347, 311 to 313, 9999*8 | 0 |
| 191 | SU terminal function selection | | 1 |
| 192 | IPF terminal function selection | | 2 |
| 193 | OL terminal function selection | | 3 |
| 194 | FU terminal function selection | | 4 |
| 195 | ABC1 terminal function selection | | 99 |
| 196 | ABC2 terminal function selection | | 9999 |
| 232 to 239 | Multi-speed setting (8 speed to 15 speed) | 0 to 590Hz, 9999 | 9999 |
| 240 | Soft-PWM operation selection | 0, 1 | 1 |
| 241 | Analog input display unit switchover | 0, 1 | 0 |
| 242 | Terminal 1 added compensation amount (terminal 2) | 0 to 100% | 100% |
| 243 | Terminal 1 added compensation amount (terminal 4) | 0 to 100% | 75% |
| 244 | Cooling fan operation selection | 0, 1, 101 to 105, 1000, 1001, 1101 to 1105 | 1 |
| 245 | Rated slip | 0 to 50%, 9999 | 9999 |
| 246 | Slip compensation time constant | 0.01 to 10s | 0.5s |
| 247 | Constant-power range slip compensation selection | 0, 9999 | 9999 |
| 248 | Self power management selection | 0 to 2 | 0 |
| 249 | Earth (ground) fault detection at start | 0, 1 | 0 |
| 250 | Stop selection | 0 to 100s, 1000 to 1100s, 8888, 9999 | 9999 |
| 251 | Output phase loss protection selection | 0, 1 | 1 |
| 252 | Override bias | 0 to 200% | 50% |
| 253 | Override gain | 0 to 200% | 150% |
| 254 | Main circuit power OFF waiting time | 1 to 3600s, 9999 | 600s |
| 255 | Life alarm status display | (0 to 255) | 0 |
| 256 | Inrush current limit circuit life display | (0 to 100%) | 100% |
| 257 | Control circuit capacitor life display | (0 to 100%) | 100% |
| 258 | Main circuit capacitor life display | (0 to 100%) | 100% |
| 259 | Main circuit capacitor life measuring | 0, 1, 11 | 0 |
| 260 | PWM frequency automatic switchover | 0, 1 | 1 |
| 261 | Power failure stop selection | 0 to 2, 11, 12, 21, 22 | 0 |
| 262 | Subtracted frequency at deceleration start | 0 to 20Hz | 3Hz |
| 263 | Subtraction starting frequency | 0 to 590Hz, 9999 | 60Hz |
| 264 | Power-failure deceleration time 1 | 0 to 3600s | 5s |
| 265 | Power-failure deceleration time 2 | 0 to 3600s, 9999 | 9999 |
| 266 | Power failure deceleration time switchover frequency | 0 to 590Hz | 60Hz |
| 267 | Terminal 4 input selection | 0 to 2 | 0 |
| 268 | Monitor decimal digits selection | 0, 1, 9999 | 9999 |
| 269 | Parameter for manufacturer setting. Do not set. | | |
| 270 | Stop-on contact/load torque high-speed frequency control selection | 0 to 3, 11, 13 | 0 |

| Pr. | Name | Setting range | Initial value |
|---|---|---|---|
| 271 | High-speed setting maximum current | 0 to 400% | 50% |
| 272 | Middle-speed setting minimum current | 0 to 400% | 100% |
| 273 | Current averaging range | 0 to 590Hz, 9999 | 9999 |
| 274 | Current averaging filter time constant | 1 to 4000 | 16 |
| 275 | Stop-on contact excitation current low-speed multiplying factor | 0 to 300%, 9999 | 9999 |
| 276 | PWM carrier frequency at stop-on contact | 0 to 9, 9999*2<br>0 to 4, 9999*3 | 9999 |
| 278 | Brake opening frequency | 0 to 30Hz | 3Hz |
| 279 | Brake opening current | 0 to 400% | 130% |
| 280 | Brake opening current detection time | 0 to 2s | 0.3s |
| 281 | Brake operation time at start | 0 to 5s | 0.3s |
| 282 | Brake operation frequency | 0 to 30Hz | 6Hz |
| 283 | Brake operation time at stop | 0 to 5s | 0.3s |
| 284 | Deceleration detection function selection | 0, 1 | 0 |
| 285 | Overspeed detection frequency (Excessive speed deviation detection frequency) | 0 to 30Hz, 9999 | 9999 |
| 286 | Droop gain | 0 to 100% | 0% |
| 287 | Droop filter time constant | 0 to 1s | 0.3s |
| 288 | Droop function activation selection | 0 to 2, 10, 11, 20 to 22 | 0 |
| 289 | Inverter output terminal filter | 5 to 50ms, 9999 | 9999 |
| 290 | Monitor negative output selection | 0 to 7 | 0 |
| 291 | Pulse train I/O selection | 0, 1, 10, 11, 20, 21, 100 | 0 |
| 292 | Automatic acceleration/deceleration | 0, 1, 3, 5 to 8, 11 | 0 |
| 293 | Acceleration/deceleration separate selection | 0 to 2 | 0 |
| 294 | UV avoidance voltage gain | 0 to 200% | 100% |
| 295 | Parameter for manufacturer setting. Do not set. | | |
| 296 | Password lock level | 0 to 6, 99, 100 to 106, 199, 9999 | 9999 |
| 297 | Password lock/unlock | (0 to 5), 1000 to 9998, 9999 | 9999 |
| 298 | Frequency search gain | 0 to 32767, 9999 | 9999 |
| 299 | Rotation direction detection selection at restarting | 0, 1, 9999 | 0 |
| 313*10 | DO0 output selection | 0 to 8, 10 to 20, 22, 25 to 28, 30 to 36, 38 to 57, 60, 61, 63 to 66, 68, 70, 79, 80, 84 to 99, 100 to 108, 110 to 116, 120, 122, 125 to 128, 130 to 136, 138 to 157, 160, 161, 163 to 166, 168, 170, 179, 180, 184 to 199, 200 to 208, 211 to 213, 247 to 250, 300 to 308, 347 to 350, 311 to 313, 9999 | 9999 |
| 314*10 | DO1 output selection | | 9999 |
| 315*10 | DO2 output selection | | 9999 |
| 316*10 | DO3 output selection | | 9999 |
| 317*10 | DO4 output selection | | 9999 |
| 318*10 | DO5 output selection | | 9999 |
| 319*10 | DO6 output selection | | 9999 |
| 320*10 | RA1 output selection | 0 to 8, 10 to 20, 22, 25 to 28, 30 to 36, 38 to 57, 60, 61, 63 to 66, 68, 70, 79, 80, 84 to 91, 94 to 99, 200 to 208, 211 to 213, 247 to 250, 9999 | 9999 |
| 321*10 | RA2 output selection | | 9999 |
| 322*10 | RA3 output selection | | 9999 |
| 328 | Parameter for manufacturer setting. Do not set. | | |
| 331 | RS-485 communication station number | 0 to 31 (0 to 247) | 0 |
| 332 | RS-485 communication speed | 3, 6, 12, 24, 48, 96, 192, 384, 576, 768, 1152 | 96 |
| 333 | RS-485 communication stop bit length / data length | 0, 1, 10, 11 | 1 |
| 334 | RS-485 communication parity check selection | 0 to 2 | 2 |
| 335 | RS-485 communication retry count | 0 to 10, 9999 | 1 |
| 336 | RS-485 communication check time interval | 0 to 999.8s, 9999 | 0s |
| 337 | RS-485 communication waiting time setting | 0 to 150ms, 9999 | 9999 |

| Pr. | Name | Setting range | Initial value |
|---|---|---|---|
| 338 | Communication operation command source | 0, 1 | 0 |
| 339 | Communication speed command source | 0 to 2 | 0 |
| 340 | Communication startup mode selection | 0 to 2, 10, 12 | 0 |
| 341 | RS-485 communication CR/LF selection | 0 to 2 | 1 |
| 342 | Communication EEPROM write selection | 0, 1 | 0 |
| 343 | Communication error count | — | 0 |
| 350*6 | Stop position command selection | 0, 1, 9999 | 9999 |
| 351*6 | Orientation speed | 0 to 30Hz | 2Hz |
| 352*6 | Creep speed | 0 to 10Hz | 0.5Hz |
| 353*6 | Creep switchover position | 0 to 16383 | 511 |
| 354*6 | Position loop switchover position | 0 to 8191 | 96 |
| 355*6 | DC injection brake start position | 0 to 255 | 5 |
| 356*6 | Internal stop position command | 0 to 16383 | 0 |
| 357*6 | Orientation in-position zone | 0 to 255 | 5 |
| 358*6 | Servo torque selection | 0 to 13 | 1 |
| 359*6 | Encoder rotation direction | 0, 1, 100, 101 | 1 |
| 360*6 | 16-bit data selection | 0 to 127 | 0 |
| 361*6 | Position shift | 0 to 16383 | 0 |
| 362*6 | Orientation position loop gain | 0.1 to 100 | 1 |
| 363*6 | Completion signal output delay time | 0 to 5s | 0.5s |
| 364*6 | Encoder stop check time | 0 to 5s | 0.5s |
| 365*6 | Orientation limit | 0 to 60s, 9999 | 9999 |
| 366*6 | Recheck time | 0 to 5s, 9999 | 9999 |
| 367*6 | Speed feedback range | 0 to 590Hz, 9999 | 9999 |
| 368*6 | Feedback gain | 0 to 100 | 1 |
| 369*6 | Number of encoder pulses | 0 to 4096 | 1024 |
| 373*6 | Encoder position tuning setting/status | 0, 1 | 0 |
| 374 | Overspeed detection level | 0 to 590Hz, 9999 | 9999 |
| 376*6 | Encoder signal loss detection enable/disable selection | 0, 1 | 0 |
| 380 | Acceleration S-pattern 1 | 0 to 50% | 0 |
| 381 | Deceleration S-pattern 1 | 0 to 50% | 0 |
| 382 | Acceleration S-pattern 2 | 0 to 50% | 0 |
| 383 | Deceleration S-pattern 2 | 0 to 50% | 0 |
| 384 | Input pulse division scaling factor | 0 to 250 | 0 |
| 385 | Frequency for zero input pulse | 0 to 590Hz | 0 |
| 386 | Frequency for maximum input pulse | 0 to 590Hz | 60Hz |
| 393*6 | Orientation selection | 0 to 2, 10 to 12 | 0 |
| 394*6 | Number of machine side gear teeth | 0 to 32767 | 1 |
| 395*6 | Number of motor side gear teeth | 0 to 32767 | 1 |
| 396*6 | Orientation speed gain (P term) | 0 to 1000 | 60 |
| 397*6 | Orientation speed integral time | 0 to 20s | 0.333s |
| 398*6 | Orientation speed gain (D term) | 0 to 100 | 1 |
| 399*6 | Orientation deceleration ratio | 0 to 1000 | 20 |
| 413*6 | Encoder pulse division ratio | 1 to 32767 | 1 |
| 414 | PLC function operation selection | 0 to 2, 11, 12 | 0 |
| 415 | Inverter operation lock mode setting | 0, 1 | 0 |
| 416 | Pre-scale function selection | 0 to 5 | 0 |
| 417 | Pre-scale setting value | 0 to 32767 | 1 |
| 419 | Position command source selection | 0 to 2, 10, 100, 110, 200, 210, 300, 310, 1110, 1310 | 0 |
| 420 | Command pulse scaling factor numerator (electronic gear numerator) | 1 to 32767 | 1 |
| 421 | Command pulse multiplication denominator (electronic gear denominator) | 1 to 32767 | 1 |
| 422 | Position control gain | 0 to 150sec$^{-1}$ | 25sec$^{-1}$ |

| Pr. | Name | Setting range | Initial value |
|---|---|---|---|
| 423 | Position feed forward gain | 0 to 100% | 0% |
| 424 | Position command acceleration/ deceleration time constant | 0 to 50s | 0s |
| 425 | Position feed forward command filter | 0 to 5s | 0s |
| 426 | In-position width | 0 to 32767 pulse | 100 pulse |
| 427 | Excessive level error | 0 to 400K pulse, 9999 | 40K pulse |
| 428 | Command pulse selection | 0 to 5 | 0 |
| 429 | Clear signal selection | 0, 1 | 1 |
| 430 | Pulse monitor selection | 0 to 5, 12, 13, 100 to 105, 112, 113, 1000 to 1005, 1012, 1013, 1100 to 1105, 1112, 1113, 2000 to 2005, 2012, 2013, 2100 to 2105, 2112, 2113, 3000 to 3005, 3012, 3013, 3100 to 3105, 3112, 3113, 8888, 9999 | 9999 |
| 432*6 | Pulse train torque command bias | 0 to 400% | 0% |
| 433*6 | Pulse train torque command gain | 0 to 400% | 150% |
| 446 | Model position control gain | 0 to 150sec$^{-1}$ | 25sec$^{-1}$ |
| 450 | Second applied motor | 0, 1, 3 to 6, 13 to 16, 30, 33, 34, 8090, 8093, 8094, 9090, 9093, 9094, 9999 | 9999 |
| 451 | Second motor control method selection | 0 to 6, 10 to 14, 20, 100 to 106, 110 to 114, 9999 | 9999 |
| 453 | Second motor capacity | 0.4 to 55kW, 9999*2<br>0 to 3600kW, 9999*3 | 9999 |
| 454 | Number of second motor poles | 2, 4, 6, 8, 10, 12, 9999 | 9999 |
| 455 | Second motor excitation current | 0 to 500A, 9999*2<br>0 to 3600A, 9999*3 | 9999 |
| 456 | Rated second motor voltage | 0 to 1000V | 575V |
| 457 | Rated second motor frequency | 10 to 400Hz, 9999 | 9999 |
| 458 | Second motor constant (R1) | 0 to 50Ω, 9999*2<br>0 to 400mΩ, 9999*3 | 9999 |
| 459 | Second motor constant (R2) | 0 to 50Ω, 9999*2<br>0 to 400mΩ, 9999*3 | 9999 |
| 460 | Second motor constant (L1) / d-axis inductance (Ld) | 0 to 6000mH, 9999*2<br>0 to 400mH, 9999*3 | 9999 |
| 461 | Second motor constant (L2) / q-axis inductance (Lq) | 0 to 6000mH, 9999*2<br>0 to 400mH, 9999*3 | 9999 |
| 462 | Second motor constant (X) | 0 to 100%, 9999 | 9999 |
| 463 | Second motor auto tuning setting/status | 0, 1, 11, 101 | 0 |
| 464 | Digital position control sudden stop deceleration time | 0 to 360s | 0 |

| Pr. | Name | Setting range | Initial value |
|---|---|---|---|
| 465 | First target position lower 4 digits | 0 to 9999 | 0 |
| 466 | First target position upper 4 digits | | 0 |
| 467 | Second target position lower 4 digits | | 0 |
| 468 | Second target position upper 4 digits | | 0 |
| 469 | Third target position lower 4 digits | | 0 |
| 470 | Third target position upper 4 digits | | 0 |
| 471 | Fourth target position lower 4 digits | | 0 |
| 472 | Fourth target position upper 4 digits | | 0 |
| 473 | Fifth target position lower 4 digits | | 0 |
| 474 | Fifth target position upper 4 digits | | 0 |
| 475 | Sixth target position lower 4 digits | | 0 |
| 476 | Sixth target position upper 4 digits | | 0 |
| 477 | Seventh target position lower 4 digits | | 0 |
| 478 | Seventh target position upper 4 digits | | 0 |
| 479 | Eighth target position lower 4 digits | | 0 |
| 480 | Eighth target position upper 4 digits | | 0 |
| 481 | Ninth target position lower 4 digits | 0 to 9999 | 0 |
| 482 | Ninth target position upper 4 digits | | 0 |
| 483 | Tenth target position lower 4 digits | | 0 |
| 484 | Tenth target position upper 4 digits | | 0 |
| 485 | Eleventh target position lower 4 digits | | 0 |
| 486 | Eleventh target position upper 4 digits | | 0 |
| 487 | Twelfth target position lower 4 digits | | 0 |
| 488 | Twelfth target position upper 4 digits | | 0 |
| 489 | Thirteenth target position lower 4 digits | | 0 |
| 490 | Thirteenth target position upper 4 digits | | 0 |
| 491 | Fourteenth target position lower 4 digits | | 0 |
| 492 | Fourteenth target position upper 4 digits | | 0 |
| 493 | Fifteenth target position lower 4 digits | | 0 |
| 494 | Fifteenth target position upper 4 digits | | 0 |
| 495 | Remote output selection | 0, 1, 10, 11 | 0 |
| 496 | Remote output data 1 | 0 to 4095 | 0 |
| 497 | Remote output data 2 | 0 to 4095 | 0 |
| 498 | PLC function flash memory clear | 0 to 9999 | 0 |
| 502 | Stop mode selection at communication error | 0 to 4, 11, 12 | 0 |
| 503 | Maintenance timer 1 | 0(1 to 9998) | 0 |
| 504 | Maintenance timer 1 warning output set time | 0 to 9998, 9999 | 9999 |
| 505 | Speed setting reference | 1 to 590Hz | 60Hz |
| 506 | Display estimated main circuit capacitor residual life | (0 to 100%) | 100% |
| 507 | Display/reset ABC1 relay contact life | 0 to 100% | 100% |
| 508 | Display/reset ABC2 relay contact life | 0 to 100% | 100% |
| 514 | Emergency drive dedicated waiting time | 0.1 to 600 s, 9999 | 9999 |
| 515 | Emergency drive dedicated retry count | 1 to 200, 9999 | 1 |
| 516 | S-pattern time at a start of acceleration | 0.1 to 2.5s | 0.1s |
| 517 | S-pattern time at a completion of acceleration | 0.1 to 2.5s | 0.1s |
| 518 | S-pattern time at a start of deceleration | 0.1 to 2.5s | 0.1s |
| 519 | S-pattern time at a completion of deceleration | 0.1 to 2.5s | 0.1s |
| 522 | Output stop frequency | 0 to 590Hz, 9999 | 9999 |

| Pr. | Name | Setting range | Initial value |
|---|---|---|---|
| 523 | Emergency drive mode selection | 100, 111, 112, 121 to 124, 200, 211, 212, 221 to 224, 300, 311, 312, 321 to 324, 400, 411, 412, 421 to 424, 9999 | 9999 |
| 524 | Emergency drive running speed | 0 to 590 Hz, 9999 | 9999 |
| 539 | MODBUS RTU communication check time interval | 0 to 999.8s, 9999 | 9999 |
| 547 | USB communication station number | 0 to 31 | 0 |
| 548 | USB communication check time interval | 0 to 999.8s, 9999 | 9999 |
| 549 | Protocol selection | 0, 1 | 0 |
| 550 | NET mode operation command source selection | 0, 1, 9999 | 9999 |
| 551 | PU mode operation command source selection | 1 to 3, 9999 | 9999 |
| 552 | Frequency jump range | 0 to 30Hz, 9999 | 9999 |
| 553 | PID deviation limit | 0 to 100%, 9999 | 9999 |
| 554 | PID signal operation selection | 0 to 3, 10 to 13 | 0 |
| 555 | Current average time | 0.1 to 1.0s | 1s |
| 556 | Data output mask time | 0 to 20s | 0s |
| 557 | Current average value monitor signal output reference current | 0 to 500A*2 | Rated inverter current |
| | | 0 to 3600A*3 | |
| 560 | Second frequency search gain | 0 to 32767, 9999 | 9999 |
| 561 | PTC thermistor protection level | 0.5 to 30kΩ, 9999 | 9999 |
| 563 | Energization time carrying-over times | (0 to 65535) | 0 |
| 564 | Operating time carrying-over times | (0 to 65535) | 0 |
| 565 | Second motor excitation current break point | 0 to 400 Hz, 9999 | 9999 |
| 566 | Second motor excitation current low-speed scaling factor | 0 to 300%, 9999 | 9999 |
| 569 | Second motor speed control gain | 0 to 200%, 9999 | 9999 |
| 570 | Multiple rating setting | 0 to 3 | 2 |
| 571 | Holding time at a start | 0 to 10s, 9999 | 9999 |
| 573 | 4 mA input check selection | 1 to 4, 11 to 14, 21 to 24, 9999 | 9999 |
| 574 | Second motor online auto tuning | 0 to 2 | 0 |
| 575 | Output interruption detection time | 0 to 3600s, 9999 | 1s |
| 576 | Output interruption detection level | 0 to 590Hz | 0Hz |
| 577 | Output interruption cancel level | 900 to 1100% | 1000% |
| 592 | Traverse function selection | 0 to 2 | 0 |
| 593 | Maximum amplitude amount | 0 to 25% | 10% |
| 594 | Amplitude compensation amount during deceleration | 0 to 50% | 10% |
| 595 | Amplitude compensation amount during acceleration | 0 to 50% | 10% |
| 596 | Amplitude acceleration time | 0.1 to 3600s | 5s |
| 597 | Amplitude deceleration time | 0.1 to 3600s | 5s |
| 599 | X10 terminal input selection | 0,1 | 0 |
| 600 | First free thermal reduction frequency 1 | 0 to 590Hz, 9999 | 9999 |
| 601 | First free thermal reduction ratio 1 | 1 to 100% | 100% |
| 602 | First free thermal reduction frequency 2 | 0 to 590Hz, 9999 | 9999 |
| 603 | First free thermal reduction ratio 2 | 1 to 100% | 100% |
| 604 | First free thermal reduction frequency 3 | 0 to 590Hz, 9999 | 9999 |
| 606 | Power failure stop external signal input selection | 0, 1 | 1 |
| 607 | Motor permissible load level | 110 to 250% | 150% |
| 608 | Second motor permissible load level | 110 to 250%, 9999 | 9999 |
| 609 | PID set point/deviation input selection | 1 to 5 | 2 |
| 610 | PID measured value input selection | 1 to 5 | 3 |
| 611 | Acceleration time at a restart | 0 to 3600s, 9999 | 9999 |

| Pr. | Name | Setting range | Initial value |
|---|---|---|---|
| 617 | Reverse rotation excitation current low-speed scaling factor | 0 to 300%, 9999 | 9999 |
| 635*6 | Cumulative pulse clear signal selection | 0 to 3 | 0 |
| 636*6 | Cumulative pulse division scaling factor | 0 to 16384 | 1 |
| 637*6 | Control terminal option—Cumulative pulse division scaling factor | 0 to 16384 | 1 |
| 638*6 | Cumulative pulse storage | 0 to 3 | 0 |
| 639 | Brake opening current selection | 0, 1 | 0 |
| 640 | Brake operation frequency selection | 0, 1 | 0 |
| 641 | Second brake sequence operation selection | 0, 7, 8, 9999 | 0 |
| 642 | Second brake opening frequency | 0 to 30Hz | 3Hz |
| 643 | Second brake opening current | 0 to 400% | 130% |
| 644 | Second brake opening current detection time | 0 to 2s | 0.3s |
| 645 | Second brake operation time at start | 0 to 5s | 0.3s |
| 646 | Second brake operation frequency | 0 to 30Hz | 6Hz |
| 647 | Second brake operation time at stop | 0 to 5s | 0.3s |
| 648 | Second deceleration detection function selection | 0, 1 | 0 |
| 650 | Second brake opening current selection | 0, 1 | 0 |
| 651 | Second brake operation frequency selection | 0, 1 | 0 |
| 653 | Speed smoothing control | 0 to 200% | 0 |
| 654 | Speed smoothing cutoff frequency | 0 to 120Hz | 20Hz |
| 655 | Analog remote output selection | 0, 1, 10, 11 | 0 |
| 656 | Analog remote output 1 | 800 to 1200% | 1000% |
| 657 | Analog remote output 2 | | 1000% |
| 658 | Analog remote output 3 | | 1000% |
| 659 | Analog remote output 4 | | 1000% |
| 660 | Increased magnetic excitation deceleration operation selection | 0, 1 | 0 |
| 661 | Magnetic excitation increase rate | 0 to 40%, 9999 | 9999 |
| 662 | Increased magnetic excitation current level | 0 to 300% | 100% |
| 663 | Control circuit temperature signal output level | 0 to 100°C | 0°C |
| 665 | Regeneration avoidance frequency gain | 0 to 200% | 100% |
| 668 | Power failure stop frequency gain | 0 to 200% | 100% |
| 675 | User parameter auto storage function selection | 1, 9999 | 9999 |
| 679 | Second droop gain | 0 to 100% | 9999 |
| 680 | Second droop filter time constant | 0 to 1s | 9999 |
| 681 | Second droop function activation selection | 0 to 2, 10, 11, 20 to 22 | 9999 |
| 682 | Second droop break point gain | 0.1 to 100% | 9999 |
| 683 | Second droop break point torque | 0.1 to 100% | 9999 |
| 684 | Tuning data unit switchover | 0, 1 | 0 |
| 686 | Maintenance timer 2 | 0 (1 to 9998) | 0 |
| 687 | Maintenance timer 2 warning output set time | 0 to 9998, 9999 | 9999 |
| 688 | Maintenance timer 3 | 0 (1 to 9998) | 0 |
| 689 | Maintenance timer 3 warning output set time | 0 to 9998, 9999 | 9999 |
| 690 | Deceleration check time | 0 to 3600s, 9999 | 1s |
| 692 | Second free thermal reduction frequency 1 | 0 to 590Hz, 9999 | 9999 |
| 693 | Second free thermal reduction ratio 1 | 1 to 100% | 100% |
| 694 | Second free thermal reduction frequency 2 | 0 to 590Hz, 9999 | 9999 |
| 695 | Second free thermal reduction ratio 2 | 1 to 100% | 100% |
| 696 | Second free thermal reduction frequency 3 | 0 to 590Hz, 9999 | 9999 |
| 699 | Input terminal filter | 5 to 50ms, 9999 | 9999 |

| Pr. | Name | Setting range | Initial value |
|---|---|---|---|
| 702 | Maximum motor frequency | 0 to 400Hz, 9999 | 9999 |
| 706 | Induced voltage constant (phi f) | 0 to 5000mV/(rad/s), 9999 | 9999 |
| 707 | Motor inertia (integer) | 10 to 999, 9999 | 9999 |
| 711 | Motor Ld decay ratio | 0 to 100%, 9999 | 9999 |
| 712 | Motor Lq decay ratio | 0 to 100%, 9999 | 9999 |
| 717 | Starting resistance tuning compensation | 0 to 200%, 9999 | 9999 |
| 721 | Starting magnetic pole position detection pulse width | 0 to 6000μs, 10000 to 16000μs, 9999 | 9999 |
| 724 | Motor inertia (exponent) | 0 to 7, 9999 | 9999 |
| 725 | Motor protection current level | 100 to 500%, 9999 | 9999 |
| 738 | Second motor induced voltage constant (phi f) | 0 to 5000mV/(rad/s), 9999 | 9999 |
| 739 | Second motor Ld decay ratio | 0 to 100%, 9999 | 9999 |
| 740 | Second motor Lq decay ratio | 0 to 100%, 9999 | 9999 |
| 741 | Second starting resistance tuning compensation | 0 to 200%, 9999 | 9999 |
| 742 | Second motor magnetic pole detection pulse width | 0 to 6000μs, 10000 to 16000μs, 9999 | 9999 |
| 743 | Second motor maximum frequency | 0 to 400Hz, 9999 | 9999 |
| 744 | Second motor inertia (integer) | 10 to 999, 9999 | 9999 |
| 745 | Second motor inertia (exponent) | 0 to 7, 9999 | 9999 |
| 746 | Second motor protection current level | 100 to 500%, 9999 | 9999 |
| 753 | Second PID action selection | 0, 10, 11, 20, 21, 50, 51, 60, 61, 70, 71, 80, 81, 90, 91, 100, 101, 1000, 1001, 1010, 1011, 2000, 2001, 2010, 2011 | 0 |
| 754 | Second PID control automatic switchover frequency | 0 to 590Hz, 9999 | 9999 |
| 755 | Second PID action set point | 0 to 100%, 9999 | 9999 |
| 756 | Second PID proportional band | 0.1 to 1000%, 9999 | 100% |
| 757 | Second PID integral time | 0.1 to 3600s, 9999 | 1s |
| 758 | Second PID differential time | 0.01 to 10.00s, 9999 | 9999 |
| 759 | PID unit selection | 0 to 43, 9999 | 9999 |
| 760 | Pre-charge fault selection | 0, 1 | 0 |
| 761 | Pre-charge ending level | 0 to 100%, 9999 | 9999 |
| 762 | Pre-charge ending time | 0 to 3600s, 9999 | 9999 |
| 763 | Pre-charge upper detection level | 0 to 100%, 9999 | 9999 |
| 764 | Pre-charge time limit | 0 to 3600s, 9999 | 9999 |
| 765 | Second pre-charge fault selection | 0, 1 | 0 |
| 766 | Second pre-charge ending level | 0 to 100%, 9999 | 9999 |
| 767 | Second pre-charge ending time | 0 to 3600s, 9999 | 9999 |
| 768 | Second pre-charge upper detection level | 0 to 100%, 9999 | 9999 |
| 769 | Second pre-charge time limit | 0 to 3600s, 9999 | 9999 |
| 774 | Operation panel monitor selection 1 | 1 to 3, 5 to 14, 17 to 20, 22 to 36, 38 to 46, 50 to 57, 61, 62, 64, 67, 68, 71 to 75, 87 to 98, 100, 9999 | 9999 |
| 775 | Operation panel monitor selection 2 | | 9999 |
| 776 | Operation panel monitor selection 3 | | 9999 |
| 777 | 4 mA input fault operation frequency | 0 to 590Hz, 9999 | 9999 |
| 778 | 4 mA input check filter | 0 to 10s | 0s |
| 779 | Operation frequency during communication error | 0 to 590Hz, 9999 | 9999 |
| 791 | Acceleration time in low-speed range | 0 to 3600s, 9999 | 9999 |
| 792 | Deceleration time in low-speed range | 0 to 3600s, 9999 | 9999 |
| 799 | Pulse increment setting for output power | 0.1, 1, 10, 100, 1000kWh | 1kWh |
| 800 | Control method selection | 0 to 6, 9 to 14, 20, 100 to 106, 109 to 114 | 20 |
| 801 | Output limit level | 0 to 400%, 9999 | 9999 |
| 802 | Pre-excitation selection | 0, 1 | 0 |
| 803 | Constant output range torque characteristic selection | 0 to 2, 10, 11 | 0 |

| Pr. | Name | Setting range | Initial value |
|---|---|---|---|
| 804 | Torque command source selection | 0 to 6 | 0 |
| 805 | Torque command value (RAM) | 600 to 1400% | 1000% |
| 806 | Torque command value (RAM,EEPROM) | 600 to 1400% | 1000% |
| 807 | Speed limit selection | 0 to 2 | 0 |
| 808 | Forward rotation speed limit/speed limit | 0 to 400Hz | 60Hz |
| 809 | Reverse rotation speed limit/reverse-side speed limit | 0 to 400Hz, 9999 | 9999 |
| 810 | Torque limit input method selection | 0, 1, 2 | 0 |
| 811 | Set resolution switchover | 0, 1, 10, 11 | 0 |
| 812 | Torque limit level (regeneration) | 0 to 400%, 9999 | 9999 |
| 813 | Torque limit level (3rd quadrant) | 0 to 400%, 9999 | 9999 |
| 814 | Torque limit level (4th quadrant) | | 9999 |
| 815 | Torque limit level 2 | | 9999 |
| 816 | Torque limit level during acceleration | | 9999 |
| 817 | Torque limit level during deceleration | | 9999 |
| 818 | Easy gain tuning response level setting | 1 to 15 | 2 |
| 819 | Easy gain tuning selection | 0 to 2 | 0 |
| 820 | Speed control P gain 1 | 0 to 1000% | 60% |
| 821 | Speed control integral time 1 | 0 to 20s | 0.333s |
| 822 | Speed setting filter 1 | 0 to 5s, 9999 | 9999 |
| 823 *6 | Speed detection filter 1 | 0 to 0.1s | 0.001s |
| 824 | Torque control P gain 1 (current loop proportional gain) | 0 to 500% | 100% |
| 825 | Torque control integral time 1 (current loop integral time) | 0 to 500ms | 5ms |
| 826 | Torque setting filter 1 | 0 to 5s, 9999 | 9999 |
| 827 | Torque detection filter 1 | 0 to 0.1s | 0s |
| 828 | Model speed control gain | 0 to 1000% | 60% |
| 829 *6 | Number of machine end encoder pulses | 0 to 4096, 9999 | 9999 |
| 830 | Speed control P gain 2 | 0 to 1000%, 9999 | 9999 |
| 831 | Speed control integral time 2 | 0 to 20s, 9999 | 9999 |
| 832 | Speed setting filter 2 | 0 to 5s, 9999 | 9999 |
| 833 *6 | Speed detection filter 2 | 0 to 0.1s, 9999 | 9999 |
| 834 | Torque control P gain 2 | 0 to 500%, 9999 | 9999 |
| 835 | Torque control integral time 2 | 0 to 500ms, 9999 | 9999 |
| 836 | Torque setting filter 2 | 0 to 5s, 9999 | 9999 |
| 837 | Torque detection filter 2 | 0 to 0.1s, 9999 | 9999 |
| 840 | Torque bias selection | 0 to 3, 24, 25, 9999 | 9999 |
| 841 | Torque bias 1 | 600 to 1400%, 9999 | 9999 |
| 842 | Torque bias 2 | 600 to 1400%, 9999 | 9999 |
| 843 | Torque bias 3 | 600 to 1400%, 9999 | 9999 |
| 844 | Torque bias filter | 0 to 5s, 9999 | 9999 |
| 845 | Torque bias operation time | 0 to 5s, 9999 | 9999 |
| 846 | Torque bias balance compensation | 0 to 10V, 9999 | 9999 |
| 847 | Fall-time torque bias terminal 1 bias | 0 to 400%, 9999 | 9999 |
| 848 | Fall-time torque bias terminal 1 gain | 0 to 400%, 9999 | 9999 |
| 849 | Analog input offset adjustment | 0 to 200% | 100% |
| 850 | Brake operation selection | 0 to 2 | 0 |
| 851 *6 | Control terminal option—Number of encoder pulses | 0 to 4096 | 2048 |
| 852 *6 | Control terminal option—Encoder rotation direction | 0, 1, 100, 101 | 1 |
| 853 *6 | Speed deviation time | 0 to 100s | 1s |
| 854 | Excitation ratio | 0 to 100% | 100% |
| 855 *6 | Control terminal option—Signal loss detection | 0, 1 | 0 |
| 858 | Terminal 4 function assignment | 0, 1, 4, 9999 | 0 |
| 859 | Torque current/Rated PM motor current | 0 to 500A, 9999 *2 | 9999 |
| | | 0 to 3600A, 9999 *3 | |

| Pr. | Name | Setting range | Initial value |
|---|---|---|---|
| 860 | Second motor torque current/Rated PM motor current | 0 to 500A, 9999 *2 | 9999 |
| | | 0 to 3600A, 9999 *3 | |
| 862 *6 | Encoder option selection | 0, 1 | 0 |
| 863 *6 | Control terminal option—Encoder pulse division ratio | 1 to 32767 | 1 |
| 864 | Torque detection | 0 to 400% | 150% |
| 865 | Low speed detection | 0 to 590Hz | 1.5Hz |
| 866 | Torque monitoring reference | 0 to 400% | 150% |
| 867 | AM output filter | 0 to 5s | 0.01s |
| 868 | Terminal 1 function assignment | 0 to 6, 9999 | 0 |
| 870 | Speed detection hysteresis | 0 to 5Hz | 0Hz |
| 871 *6 | Control terminal option—Encoder position tuning setting/status | 0, 1 | 0 |
| 872 | Input phase loss protection selection | 0, 1 | 0 |
| 873 *6 | Speed limit | 0 to 400Hz | 20Hz |
| 874 | OLT level setting | 0 to 400% | 150% |
| 875 | Fault definition | 0, 1 | 0 |
| 876 *6 | Thermal protector input | 0, 1 | 1 |
| 877 | Speed feed forward control/ model adaptive speed control selection | 0 to 2 | 0 |
| 878 | Speed feed forward filter | 0 to 1s | 0s |
| 879 | Speed feed forward torque limit | 0 to 400% | 150% |
| 880 | Load inertia ratio | 0 to 200 times | 7 times |
| 881 | Speed feed forward gain | 0 to 1000% | 0% |
| 882 | Regeneration avoidance operation selection | 0 to 2 | 0 |
| 883 | Regeneration avoidance operation level | 300 to 1200V | 940VDC |
| 884 | Regeneration avoidance at deceleration detection sensitivity | 0 to 5 | 0 |
| 885 | Regeneration avoidance compensation frequency limit value | 0 to 590Hz, 9999 | 6Hz |
| 886 | Regeneration avoidance voltage gain | 0 to 200% | 100% |
| 887 *6 | Control terminal option—Encoder magnetic pole position offset | 0 to 16383, 65535 | 65535 |
| 888 | Free parameter 1 | 0 to 9999 | 9999 |
| 889 | Free parameter 2 | 0 to 9999 | 9999 |
| 891 | Cumulative power monitor digit shifted times | 0 to 4, 9999 | 9999 |
| 892 | Load factor | 30 to 150% | 100% |
| 893 | Energy saving monitor reference (motor capacity) | 0.1 to 55kW *2 | Rated inverter capacity |
| | | 0 to 3600kW *3 | |
| 894 | Control selection during commercial power-supply operation | 0 to 3 | 0 |
| 895 | Power saving rate reference value | 0, 1, 9999 | 9999 |
| 896 | Power unit cost | 0 to 500, 9999 | 9999 |
| 897 | Power saving monitor average time | 0, 1 to 1000h, 9999 | 9999 |
| 898 | Power saving cumulative monitor clear | 0, 1, 10, 9999 | 9999 |
| 899 | Operation time rate (estimated value) | 0 to 100%, 9999 | 9999 |
| 900 | FM terminal calibration | — | — |
| 901 | AM terminal calibration | — | — |
| 902 | Terminal 2 frequency setting bias frequency | 0 to 590Hz | 0Hz |
| | Terminal 2 frequency setting bias | 0 to 300% | 0% |
| 903 | Terminal 2 frequency setting gain frequency | 0 to 590Hz | 60Hz |
| | Terminal 2 frequency setting gain | 0 to 300% | 100% |
| 904 | Terminal 4 frequency setting bias frequency | 0 to 590Hz | 0Hz |
| | Terminal 4 frequency setting bias | 0 to 300% | 20% |
| 905 | Terminal 4 frequency setting gain frequency | 0 to 590Hz | 60Hz |
| | Terminal 4 frequency setting gain | 0 to 300% | 100% |
| 917 | Terminal 1 bias frequency (speed) | 0 to 590Hz | 0Hz |
| | Terminal 1 bias (speed) | 0 to 300% | 0% |

| Pr. | Name | Setting range | Initial value |
|---|---|---|---|
| 918 | Terminal 1 gain frequency (speed) | 0 to 590Hz | 60Hz |
| | Terminal 1 gain (speed) | 0 to 300% | 100% |
| 919 | Terminal 1 bias command (torque/ magnetic flux) | 0 to 400% | 0% |
| | Terminal 1 bias (torque/ magnetic flux) | 0 to 300% | 0% |
| 920 | Terminal 1 gain command (torque/ magnetic flux) | 0 to 400% | 150% |
| | Terminal 1 gain (torque/ magnetic flux) | 0 to 300% | 100% |
| 932 | Terminal 4 bias command (torque/ magnetic flux) | 0 to 400% | 0% |
| | Terminal 4 bias (torque/ magnetic flux) | 0 to 300% | 20% |
| 933 | Terminal 4 gain command (torque/ magnetic flux) | 0 to 400% | 150% |
| | Terminal 4 gain (torque/ magnetic flux) | 0 to 300% | 100% |
| 934 *9 | PID display bias coefficient | 0 to 500.00, 9999 | 9999 |
| | PID display bias analog value | 0 to 300% | 20% |
| 935 *9 | PID display gain coefficient | 0 to 500.00, 9999 | 9999 |
| | PID display gain analog value | 0 to 300% | 100% |
| 989 | Parameter copy alarm release | 10 *2 | 10 *2 |
| | | 100 *3 | 100 *3 |
| 990 | PU buzzer control | 0, 1 | 1 |
| 991 *9 | PU contrast adjustment | 0 to 63 | 58 |
| 992 | Parameter for manufacturer setting. Do not set. | | |
| 994 | Droop break point gain | 0.1 to 100%, 9999 | 9999 |
| 995 | Droop break point torque | 0.1 to 100% | 100% |
| 997 | Fault initiation | 0 to 255, 9999 | 9999 |
| 998 *9 | PM parameter initialization | 0, 8009, 8109, 9009, 9109 | 0 |
| 999 *9 | Automatic parameter setting | 1, 2,10 to 13, 20, 21, 9999 | 9999 |
| 1000 | Direct setting selection | 0 to 2 | 0 |
| 1002 | Lq tuning target current adjustment coefficient | 50 to 150%, 9999 | 9999 |
| 1003 | Notch filter frequency | 0, 8 to 1250Hz | 0 |
| 1004 | Notch filter depth | 0 to 3 | 0 |
| 1005 | Notch filter width | 0 to 3 | 0 |
| 1006 | Clock (year) | 2000 to 2099 | 2000 |
| 1007 | Clock (month, day) | 101 to 131, 201 to 229, 301 to 331, 401 to 430, 501 to 531, 601 to 630, 701 to 731, 801 to 831, 901 to 930, 1001 to 1031, 1101 to 1130, 1201 to 1231 | 101 |
| 1008 | Clock (hour, minute) | 0 to 59, 100 to 159, 200 to 259, 300 to 359, 400 to 459, 500 to 559, 600 to 659, 700 to 759, 800 to 859, 900 to 959, 1000 to 1059, 1100 to 1159, 1200 to 1259, 1300 to 1359, 1400 to 1459, 1500 to 1559, 1600 to 1659, 1700 to 1759, 1800 to 1859, 1900 to 1959, 2000 to 2059, 2100 to 2159, 2200 to 2259, 2300 to 2359 | 0 |
| 1013 | Emergency drive running speed after retry reset | 0 to 590 Hz | 60 Hz |
| 1015 | Integral stop selection at limited frequency | 0 to 2, 10 to 12 | 0 |
| 1016 | PTC thermistor protection detection time | 0 to 60s | 0s |
| 1018 | Monitor with sign selection | 0, 1, 9999 | 9999 |
| 1020 | Trace operation selection | 0 to 4 | 0 |
| 1021 | Trace mode selection | 0 to 2 | 0 |
| 1022 | Sampling cycle | 0 to 9 | 2 |
| 1023 | Number of analog channels | 1 to 8 | 4 |
| 1024 | Sampling auto start | 0, 1 | 0 |

| Pr. | Name | Setting range | Initial value |
|---|---|---|---|
| 1025 | Trigger mode selection | 0 to 4 | 0 |
| 1026 | Number of sampling before trigger | 0 to 100% | 90% |
| 1027 | Analog source selection (1ch) | 1 to 3, 5 to 14, 17 to 20, 22 to 24, 32 to 35, 39 to 42, 52 to 54, 61, 62, 64, 67, 68, 71 to 75, 87 to 98, 201 to 213, 222 to 227, 230 to 232, 235 to 238 | 201 |
| 1028 | Analog source selection (2ch) | | 202 |
| 1029 | Analog source selection (3ch) | | 203 |
| 1030 | Analog source selection (4ch) | | 204 |
| 1031 | Analog source selection (5ch) | | 205 |
| 1032 | Analog source selection (6ch) | | 206 |
| 1033 | Analog source selection (7ch) | | 207 |
| 1034 | Analog source selection (8ch) | | 208 |
| 1035 | Analog trigger channel | 1 to 8 | 1 |
| 1036 | Analog trigger operation selection | 0, 1 | 0 |
| 1037 | Analog trigger level | 600 to 1400 | 1000 |
| 1038 | Digital source selection (1ch) | 1 to 255 | 1 |
| 1039 | Digital source selection (2ch) | | 2 |
| 1040 | Digital source selection (3ch) | | 3 |
| 1041 | Digital source selection (4ch) | | 4 |
| 1042 | Digital source selection (5ch) | | 5 |
| 1043 | Digital source selection (6ch) | | 6 |
| 1044 | Digital source selection (7ch) | | 7 |
| 1045 | Digital source selection (8ch) | | 8 |
| 1046 | Digital trigger channel | 1 to 8 | 1 |
| 1047 | Digital trigger operation selection | 0, 1 | 0 |
| 1048 | Parameter for manufacturer setting. Do not set. | | |
| 1049 | USB host reset | 0, 1 | 0 |
| 1072 | DC brake judgment time for anti-sway control operation | 0 to 10s | 3s |
| 1073 | Anti-sway control operation selection | 0, 1 | 0 |
| 1074 | Anti-sway control frequency | 0.05 to 3Hz, 9999 | 1Hz |
| 1075 | Anti-sway control depth | 0 to 3 | 0 |
| 1076 | Anti-sway control width | 0 to 3 | 0 |
| 1077 | Rope length | 0.1 to 50m | 1m |
| 1078 | Trolley weight | 1 to 50000kg | 1kg |
| 1079 | Load weight | 1 to 50000kg | 1kg |
| 1103 | Deceleration time at emergency stop | 0 to 3600s | 5s |
| 1105 | Encoder magnetic pole position offset | 0 to 16383, 65535 | 65535 |
| 1106 | Torque monitor filter | 0 to 5s, 9999 | 9999 |
| 1107 | Running speed monitor filter | 0 to 5s, 9999 | 9999 |
| 1108 | Excitation current monitor filter | 0 to 5s, 9999 | 9999 |
| 1113 | Speed limit method selection | 0 to 2, 10, 9999 | 9999 |
| 1114 | Torque command reverse selection | 0, 1 | 1 |
| 1115 | Speed control integral term clear time | 0 to 9998ms | 0s |
| 1116 | Constant output range speed control P gain compensation | 0 to 100% | 0% |
| 1117 | Speed control P gain 1 (per-unit system) | 0 to 300, 9999 | 9999 |
| 1118 | Speed control P gain 2 (per-unit system) | 0 to 300, 9999 | 9999 |
| 1119 | Model speed control gain (per-unit system) | 0 to 300, 9999 | 9999 |
| 1121 | Per-unit speed control reference frequency | 0 to 400 Hz | 120Hz*2<br>60Hz*3 |
| 1134 | PID upper limit manipulated value | 0 to 100% | 100% |
| 1135 | PID lower limit manipulated value | 0 to 100% | 100% |
| 1136*9 | Second PID display bias coefficient | 0 to 500, 9999 | 9999 |
| 1137*9 | Second PID display bias analog value | 0 to 300% | 20% |
| 1138*9 | Second PID display gain coefficient | 0 to 500, 9999 | 9999 |
| 1139*9 | Second PID display gain analog value | 0 to 300% | 100% |
| 1140 | Second PID set point/ deviation input selection | 1 to 5 | 2 |
| 1141 | Second PID measured value input selection | 1 to 5 | 3 |
| 1142 | Second PID unit selection | 0 to 43, 9999 | 9999 |
| 1143 | Second PID upper limit | 0 to 100%, 9999 | 9999 |
| 1144 | Second PID lower limit | 0 to 100%, 9999 | 9999 |
| 1145 | Second PID deviation limit | 0 to 100%, 9999 | 9999 |
| 1146 | Second PID signal operation selection | 0 to 3, 10 to 13 | 0 |
| 1147 | Second output interruption detection time | 0 to 3600s, 9999 | 1s |
| 1148 | Second output interruption detection level | 0 to 590Hz | 0Hz |
| 1149 | Second output interruption cancel level | 900 to 1100% | 1000% |
| 1150 to 1199 | User parameters 1 to 50 | 0 to 65535 | 0 |
| 1220 | Target position/speed selection | 0 to 2 | 0 |
| 1221 | Start command edge detection selection | 0, 1 | 0 |
| 1222 | First positioning acceleration time | 0.01 to 360s | 5s |
| 1223 | First positioning deceleration time | 0.01 to 360s | 5s |
| 1224 | First positioning dwell time | 0 to 20000ms | 0ms |
| 1225 | First positioning sub-function | 0 to 2, 10 to 12, 100 to 102, 110 to 112 | 10 |
| 1226 | Second positioning acceleration time | 0.01 to 360s | 5s |
| 1227 | Second positioning deceleration time | 0.01 to 360s | 5s |
| 1228 | Second positioning dwell time | 0 to 20000ms | 0ms |
| 1229 | Second positioning sub-function | 0 to 2, 10 to 12, 100 to 102, 110 to 112 | 10 |
| 1230 | Third positioning acceleration time | 0.01 to 360s | 5s |
| 1231 | Third positioning deceleration time | 0.01 to 360s | 5s |
| 1232 | Third positioning dwell time | 0 to 20000ms | 0ms |
| 1233 | Third positioning sub-function | 0 to 2, 10 to 12, 100 to 102, 110 to 112 | 10 |
| 1234 | Fourth positioning acceleration time | 0.01 to 360s | 5s |
| 1235 | Fourth positioning deceleration time | 0.01 to 360s | 5s |
| 1236 | Fourth positioning dwell time | 0 to 20000ms | 0ms |
| 1237 | Fourth positioning sub-function | 0 to 2, 10 to 12, 100 to 102, 110 to 112 | 10 |
| 1238 | Fifth positioning acceleration time | 0.01 to 360s | 5s |
| 1239 | Fifth positioning deceleration time | 0.01 to 360s | 5s |
| 1240 | Fifth positioning dwell time | 0 to 20000ms | 0ms |
| 1241 | Fifth positioning sub-function | 0 to 2, 10 to 12, 100 to 102, 110 to 112 | 10 |
| 1242 | Sixth positioning acceleration time | 0.01 to 360s | 5s |
| 1243 | Sixth positioning deceleration time | 0.01 to 360s | 5s |
| 1244 | Sixth positioning dwell time | 0 to 20000ms | 0ms |
| 1245 | Sixth positioning sub-function | 0 to 2, 10 to 12, 100 to 102, 110 to 112 | 10 |
| 1246 | Seventh positioning acceleration time | 0.01 to 360s | 5s |
| 1247 | Seventh positioning deceleration time | 0.01 to 360s | 5s |
| 1248 | Seventh positioning dwell time | 0 to 20000ms | 0ms |
| 1249 | Seventh positioning sub-function | 0 to 2, 10 to 12, 100 to 102, 110 to 112 | 10 |
| 1250 | Eighth positioning acceleration time | 0.01 to 360s | 5s |
| 1251 | Eighth positioning deceleration time | 0.01 to 360s | 5s |
| 1252 | Eighth positioning dwell time | 0 to 20000ms | 0ms |
| 1253 | Eighth positioning sub-function | 0 to 2, 10 to 12, 100 to 102, 110 to 112 | 10 |
| 1254 | Ninth positioning acceleration time | 0.01 to 360s | 5s |
| 1255 | Ninth positioning deceleration time | 0.01 to 360s | 5s |
| 1256 | Ninth positioning dwell time | 0 to 20000ms | 0ms |
| 1257 | Ninth positioning sub-function | 0 to 2, 10 to 12, 100 to 102, 110 to 112 | 10 |
| 1258 | Tenth positioning acceleration time | 0.01 to 360s | 5s |
| 1259 | Tenth positioning deceleration time | 0.01 to 360s | 5s |
| 1260 | Tenth positioning dwell time | 0 to 20000ms | 0ms |
| 1261 | Tenth positioning sub-function | 0 to 2, 10 to 12, 100 to 102, 110 to 112 | 10 |
| 1262 | Eleventh positioning acceleration time | 0.01 to 360s | 5s |
| 1263 | Eleventh positioning deceleration time | 0.01 to 360s | 5s |
| 1264 | Eleventh positioning dwell time | 0 to 20000ms | 0ms |
| 1265 | Eleventh positioning sub-function | 0 to 2, 10 to 12, 100 to 102, 110 to 112 | 10 |
| 1266 | Twelfth positioning acceleration time | 0.01 to 360s | 5s |
| 1267 | Twelfth positioning deceleration time | 0.01 to 360s | 5s |
| 1268 | Twelfth positioning dwell time | 0 to 20000ms | 0ms |
| 1269 | Twelfth positioning sub-function | 0 to 2, 10 to 12, 100 to 102, 110 to 112 | 10 |
| 1270 | Thirteenth positioning acceleration time | 0.01 to 360s | 5s |
| 1271 | Thirteenth positioning deceleration time | 0.01 to 360s | 5s |
| 1272 | Thirteenth positioning dwell time | 0 to 20000ms | 0ms |
| 1273 | Thirteenth positioning sub-function | 0 to 2, 10 to 12, 100 to 102, 110 to 112 | 10 |
| 1274 | Fourteenth positioning acceleration time | 0.01 to 360s | 5s |
| 1275 | Fourteenth positioning deceleration time | 0.01 to 360s | 5s |
| 1276 | Fourteenth positioning dwell time | 0 to 20000ms | 0ms |
| 1277 | Fourteenth positioning sub-function | 0 to 2, 10 to 12, 100 to 102, 110 to 112 | 10 |
| 1278 | Fifteenth positioning acceleration time | 0.01 to 360s | 5s |
| 1279 | Fifteenth positioning deceleration time | 0.01 to 360s | 5s |
| 1280 | Fifteenth positioning dwell time | 0 to 20000ms | 0ms |
| 1281 | Fifteenth positioning sub-function | 0, 2, 10, 12, 100, 102, 110, 112 | 10 |
| 1282 | Home position return method selection | 0 to 6 | 4 |
| 1283 | Home position return speed | 0 to 30Hz | 2Hz |
| 1284 | Home position return creep speed | 0 to 10Hz | 0.5Hz |
| 1285 | Home position shift amount lower 4 digits | 0 to 9999 | 0 |
| 1286 | Home position shift amount upper 4 digits | 0 to 9999 | 0 |
| 1287 | Travel distance after proximity dog ON lower 4 digits | 0 to 9999 | 2048 |
| 1288 | Travel distance after proximity dog ON upper 4 digits | 0 to 9999 | 0 |
| 1289 | Home position return stopper torque | 0 to 200% | 40% |
| 1290 | Home position return stopper waiting time | 0 to 10s | 0.5s |
| 1292 | Position control terminal input selection | 0, 1 | 0 |
| 1293 | Roll feeding mode selection | 0, 1 | 0 |
| 1294 | Position detection lower 4 digits | 0 to 9999 | 0 |
| 1295 | Position detection upper 4 digits | 0 to 9999 | 0 |
| 1296 | Position detection selection | 0 to 2 | 0 |
| 1297 | Position detection hysteresis width | 0 to 32767 | 0 |
| 1298 | Second position control gain | 0 to 150sec$^{-1}$ | 25sec$^{-1}$ |
| 1299 | Second pre-excitation selection | 0, 1 | 0 |
| 1300 to 1343 | Communication option parameters | | |
| 1348 | P/PI control switchover frequency | 0 to 400Hz | 0Hz |
| 1349 | Emergency stop operation selection | 0, 1, 10, 11 | 0 |
| 1350 to 1359 | Communication option parameters | | |
| 1410 | Starting times lower 4 digits | 0 to 9999 | 0 |

| Pr. | Name | Setting range | Initial value |
|---|---|---|---|
| 1411 | Starting times upper 4 digits | 0 to 9999 | 0 |
| 1412 | Motor induced voltage constant (phi f) exponent | 0 to 2, 9999 | 9999 |
| 1413 | Second motor induced voltage constant (phi f) exponent | 0 to 2, 9999 | 9999 |
| 1480 | Load characteristics measurement mode | 0 to 5, 81 to 85 | 0 |
| 1481 | Load characteristics load reference 1 | 0 to 400% | 9999 |
| 1482 | Load characteristics load reference 2 | | 9999 |
| 1483 | Load characteristics load reference 3 | | 9999 |
| 1484 | Load characteristics load reference 4 | | 9999 |
| 1485 | Load characteristics load reference 5 | | 9999 |
| 1486 | Load characteristics maximum frequency | 0 to 590 Hz | 60 Hz |
| 1487 | Load characteristics minimum frequency | 0 to 590 Hz | 6 Hz |
| 1488 | Upper limit warning detection width | 0 to 400%, 9999 | 20% |
| 1489 | Lower limit warning detection width | 0 to 400%, 9999 | 20% |
| 1490 | Upper limit fault detection width | 0 to 400%, 9999 | 9999 |
| 1491 | Lower limit fault detection width | 0 to 400%, 9999 | 9999 |
| 1492 | Load status detection signal delay time / load reference measurement waiting time | 0 to 60 s | 1 s |
| 1499 | Parameter for manufacturer setting. Do not set. | | |

*1 Differs according to capacities.
- 5%: FR-A860-00027
- 3%: FR-A860-00061
- 2%: FR-A860-00090, 00170
- 1%: FR-A860-00320 or higher

*2 For FR-A860-01080 or lower
*3 For FR-A860-01440 or higher
*4 For FR-A860-00170 or lower
*5 For FR-A860-00320 or higher
*6 The setting is available only when a vector control compatible option is installed. To check the availability of the parameter for each option, refer to the Instruction Manual (Detailed).
*7 The setting value "60" is only available for **Pr.178**, and "61" is only for **Pr.179**.
*8 The setting values "92, 93, 192, 193" are only available for **Pr.190 to Pr.194**.
*9 These are the simple mode parameters when the FR-LU08 is installed. (Initially set to the extended mode.)
*10 The setting is available when the PLC function is enabled.

# Appendix

## Appendix 1 Instructions for UL and cUL

(Standard to comply with: UL 508C, CSA C22.2 No.274-13)

### ◆ General precaution

CAUTION - Risk of Electric Shock -
The bus capacitor discharge time is 10 minutes. Before starting wiring or inspection, switch power off, wait for more than 10 minutes, and check for residual voltage between terminal P/+ and N/- with a meter etc., to avoid a hazard of electrical shock.
ATTENTION - Risque de choc électrique -
La durée de décharge du condensateur de bus est de 10 minutes. Avant de commencer le câblage ou l’inspection, mettez l’appareil hors tension et attendez plus de 10 minutes.

### ◆ Installation

- The FR-A860-00450 and lower inverters have been approved as products for a UL type1 enclosure that is suitable for Installation in a Compartment Handling Conditioned Air (Plenum).
  Install the inverter so that the ambient temperature, humidity and ambience of the inverter will satisfy the specifications. (Refer to **page 5**.)

- The FR-A860-00680 and higher inverters have been approved as products for use in enclosure and approval tests were conducted under the following conditions.
  Design the enclosure so that the surrounding air temperature, humidity and ambience of the inverter will satisfy the above specifications. (Refer to **page 5**.)

#### ◆ Branch circuit protection

For installation in the United States, Class T, Class J, Class CC, or Class L fuse must be provided, in accordance with the National Electrical Code and any applicable local codes.
For installation in Canada, Class T, Class J, Class CC, or Class L fuse must be provided, in accordance with the Canadian Electrical Code and any applicable local codes.

| FR-A860-[] | | 00027 | 00061 | 00090 | 00170 | 00320 | 00450 | 00680 | 01080 | 01440 | 01670 | 02430 | 02890 | 03360 | 04420 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rated fuse voltage(V) | | 600 V or more | | | | | | | | | | | | | |
| Fuse allowable rating (A) | Without power factor improving reactor | 10 | 20 | 30 | 40 | 80 | 125 | 125 | 175 | — | — | — | — | — | — |
| | With power factor improving reactor | 6 | 10 | 15 | 25 | 40 | 60 | 100 | 150 | 200 | 250 | 300 | 400 | 450 | 600 |

### ◆ Wiring to the power supply and the motor

Refer to the National Electrical Code (Article 310) regarding the allowable current of the cable. Select the cable size for 125% of the rated current according to the National Electrical Code (Article 430).
For wiring the input (R/L1, S/L2, T/L3) and output (U, V, W) terminals of the inverter, use the UL listed copper, stranded wires (rated at 75°C) and round crimping terminals. Crimp the crimping terminals with the crimping tool recommended by the terminal manufacturer.

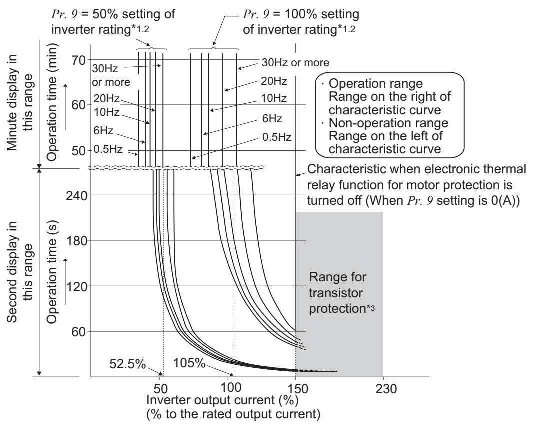
### ◆ Short circuit ratings

Suitable for use in a circuit capable of delivering not more than 100 kA rms symmetrical amperes, 600 V maximum.

### ◆ Motor overload protection

When using the electronic thermal relay function as motor overload protection, set the rated motor current in **Pr.9 Electronic thermal O/L relay**.

Operation characteristics of electronic thermal relay function




This function detects the overload (overheat) of the motor, stops the operation of the inverter's output transistor, and stops the output. (The operation characteristic is shown on the left.)

*1 When a value 50% of the inverter rated output current (current value) is set in **Pr.9**
*2 The % value denotes the percentage to the inverter rated current. It is not the percentage to the rated motor current.
*3 Transistor protection is activated depending on the temperature of the heat sink. The protection may be activated even with less than 150% depending on the operating conditions.

**NOTE**

- The internal accumulated heat value of the electronic thermal relay function is reset by inverter power reset and reset signal input. Avoid unnecessary reset and power-OFF.
- When multiple motors are driven with a single inverter or when a multi-pole motor or a special motor is driven, install an external thermal relay (OCR) between the inverter and motors. Note that the current indicated on the motor rating plate is affected by the line-to-line leakage current (details in the Instruction Manual (Detailed)) when selecting the setting for an external thermal relay.
- The cooling effect of the motor drops during low-speed operation. Use a thermal protector or a motor with built-in thermistor.
- When the difference between the inverter and motor capacities is large and the setting is small, the protective characteristics of the electronic thermal relay function will be deteriorated. In this case, use an external thermal relay.
- A special motor cannot be protected by the electronic thermal relay function. Use an external thermal relay.
- Motor over temperature sensing is not provided by the drive.

# Appendix 2 Restricted Use of Hazardous Substances in Electronic and Electrical Products

The mark of restricted use of hazardous substances in electronic and electrical products is applied to the product as follows based on the “Management Methods for the Restriction of the Use of Hazardous Substances in Electrical and Electronic Products” of the People's Republic of China.

电器电子产品有害物质限制使用标识要求

环境保护使用期限标识

本产品中所含有的有害物质的名称、含量、含有部件如下表所示。

• 产品中所含有害物质的名称及含量

| 部件名称 *2 | 有害物质 *1 | | | | | |
|---|---|---|---|---|---|---|
| | 铅 (Pb) | 汞 (Hg) | 镉 (Cd) | 六价铬 (Cr (VI)) | 多溴联苯 (PBB) | 多溴二苯醚 (PBDE) |
| 电路板组件 （包括印刷电路板及其构成的零部件，如电阻、电容、集成电路、连接器等）、电子部件 | × | ○ | × | ○ | ○ | ○ |
| 金属壳体、金属部件 | × | ○ | ○ | ○ | ○ | ○ |
| 树脂壳体、树脂部件 | ○ | ○ | ○ | ○ | ○ | ○ |
| 螺丝、电线 | ○ | ○ | ○ | ○ | ○ | ○ |

上表依据 SJ/T11364 的规定编制。
○：表示该有害物质在该部件所有均质材料中的含量均在 GB/T26572 规定的限量要求以下。
×：表示该有害物质在该部件的至少一种均质材料中的含量超出 GB/T26572 规定的限量要求。
*1 即使表中记载为 ×，根据产品型号，也可能会有有害物质的含量为限制值以下的情况。
*2 根据产品型号，一部分部件可能不包含在产品中。

# MEMO

WARRANTY

When using this product, make sure to understand the warranty described below.

## 1. Warranty period and coverage

We will repair any failure or defect (hereinafter referred to as "failure") in our FA equipment (hereinafter referred to as the "Product") arisen during warranty period at no charge due to causes for which we are responsible through the distributor from which you purchased the Product or our service provider. However, we will charge the actual cost of dispatching our engineer for an on-site repair work on request by customer in Japan or overseas countries. We are not responsible for any on-site readjustment and/or trial run that may be required after a defective unit are repaired or replaced.

**[Term]**

The term of warranty for Product is twelve months after your purchase or delivery of the Product to a place designated by you or eighteen months from the date of manufacture whichever comes first ("Warranty Period"). Warranty period for repaired Product cannot exceed beyond the original warranty period before any repair work.

**[Limitations]**

(1) You are requested to conduct an initial failure diagnosis by yourself, as a general rule. It can also be carried out by us or our service company upon your request and the actual cost will be charged.
However, it will not be charged if we are responsible for the cause of the failure.

(2) This limited warranty applies only when the condition, method, environment, etc. of use are in compliance with the terms and conditions and instructions that are set forth in the instruction manual and user manual for the Product and the caution label affixed to the Product.

(3) Even during the term of warranty, the repair cost will be charged on you in the following cases;
- a failure caused by your improper storing or handling, carelessness or negligence, etc., and a failure caused by your hardware or software problem
- a failure caused by any alteration, etc. to the Product made on your side without our approval
- a failure which may be regarded as avoidable, if your equipment in which the Product is incorporated is equipped with a safety device required by applicable laws and has any function or structure considered to be indispensable according to a common sense in the industry
- a failure which may be regarded as avoidable if consumable parts designated in the instruction manual, etc. are duly maintained and replaced
- any replacement of consumable parts (condenser, cooling fan, etc.)
- a failure caused by external factors such as inevitable accidents, including without limitation fire and abnormal fluctuation of voltage, and acts of God, including without limitation earthquake, lightning and natural disasters
- a failure generated by an unforeseeable cause with a scientific technology that was not available at the time of the shipment of the Product from our company
- any other failures which we are not responsible for or which you acknowledge we are not responsible for

## 2. Term of warranty after the stop of production

(1) We may accept the repair at charge for another seven (7) years after the production of the product is discontinued. The announcement of the stop of production for each model can be seen in our Sales and Service, etc.

(2) Please note that the Product (including its spare parts) cannot be ordered after its stop of production.

## 3. Service in overseas

Our regional FA Center in overseas countries will accept the repair work of the Product; however, the terms and conditions of the repair work may differ depending on each FA Center. Please ask your local FA center for details.

## 4. Exclusion of loss in opportunity and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi Electric shall not be liable for compensation to:

(1) Damages caused by any cause found not to be the responsibility of Mitsubishi Electric.

(2) Loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi Electric products.

(3) Special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi Electric products.

(4) Replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

## 5. Change of Product specifications

Specifications listed in our catalogs, manuals or technical documents may be changed without notice.

## 6. Application and use of the Product

(1) For the use of our product, its applications should be those that may not result in a serious damage even if any failure or malfunction occurs in product, and a backup or fail-safe function should operate on an external system to product when any failure or malfunction occurs.

(2) Our product is designed and manufactured as a general purpose product for use at general industries.
Therefore, applications substantially influential on the public interest for such as atomic power plants and other power plants of electric power companies, and also which require a special quality assurance system, including applications for railway companies and government or public offices are not recommended, and we assume no responsibility for any failure caused by these applications when used.
In addition, applications which may be substantially influential to human lives or properties for such as airlines, medical treatments, railway service, incineration and fuel systems, man-operated material handling equipment, entertainment machines, safety machines, etc. are not recommended, and we assume no responsibility for any failure caused by these applications when used.
We will review the acceptability of the abovementioned applications, if you agree not to require a specific quality for a specific application. Please contact us for consultation.

## ◆ About the enclosed CD-ROM

- The enclosed CD-ROM contains PDF copies of the manuals related to this product.

## ◆ Before using the enclosed CD-ROM

- The copyright and other rights of the enclosed CD-ROM all belong to Mitsubishi Electric Corporation.
- No part of the enclosed CD-ROM may be copied or reproduced without the permission of Mitsubishi Electric Corporation.
- Specifications of the enclosed CD-ROM are subject to change for modification without notice.
- We are not responsible for any damages and lost earnings, etc. from use of the enclosed CD-ROM.
- Trademarks
  Microsoft, Windows, Windows Vista, and Internet Explorer are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.
  Adobe and Adobe Reader are either registered trademarks or trademarks of Adobe Systems Incorporated in the United States and/or other countries.
  Intel and Pentium are trademarks of Intel Corporation in the United States and/or other countries.
  Other company and product names of companies herein are all trademarks or registered trademarks of those respective companies.
- Warranty
  We do not provide a warranty against defects in the enclosed CD-ROM and related documents.

**NOTE**

- This is a personal computer dedicated CD-ROM. Do not attempt to play it on ordinary audio devices. The loud volume may damage hearing and speakers.

## ◆ System requirements for the enclosed CD-ROM

- The following system is required to read instruction manuals contained in the enclosed CD-ROM.

| Item | Specifications |
|---|---|
| OS | Microsoft® Windows® 10, Windows® 8.1, Windows® 8, Windows® 7, Windows Vista® |
| CPU | Intel® Pentium® or better processor |
| Memory | 128 MB of RAM |
| Hard disk | 90 MB of available hard-disk space |
| CD-ROM drive | Double speed or more (more than quadruple speed is recommended) |
| Monitor | 800×600 dot or more |
| Application | Adobe® Reader® 7.0 or more<br>Internet Explorer® 6.0 or more |

## ◆ Operating method of the enclosed CD-ROM

- How to read instruction manuals
  Step 1. Start a personal computer and place the enclosed CD-ROM in the CD-ROM drive.
  Step 2. The main window automatically opens by the web browser.
  Step 3. Click a manual you want to read in the "INSTRUCTION MANUAL" list.
  Step 4. PDF manual you clicked opens.

- Manual opening of the enclosed CD-ROM
  Step 1. Start a personal computer and place the enclosed CD-ROM in the CD-ROM drive.
  Step 2. Open "index.html" file in the enclosed CD-ROM.
  Step 3. The main window opens by the web browser. Follow the instructions from Step 3 of "How to read instruction manuals".

- PDF data of the instruction manual are stored in "MANUAL" folder on the enclosed CD-ROM.

REVISIONS

*The manual number is given on the bottom left of the back cover.

| Revision Date | *Manual Number | Revision |
|---|---|---|
| Nov. 2014 | IB-0600562ENG-A | First edition |
| Jan. 2015 | IB-0600562ENG-B | Added<br>• FR-A860-00027 to 00170 |
| May 2015 | IB-0600562ENG-C | Added<br>• Location change of earth (ground) terminals for the FR-A860-00027 to 00170 |
| Oct. 2016 | IB-0600562ENG-D | Added<br>• Start count monitor (Pr.1410, Pr.1411)<br>• Enhanced functions in the position command source selection (Pr.419 = 10, 100, 110, 1110)<br>• Enhanced auxiliary functions for position control by point tables (auxiliary function parameter setting: 2, 12, 102, 112)<br>• Enhanced function in the stop mode selection at communication error (Pr.502 = 4)<br>• Excitation current low-speed scaling factor (Pr.14 = 12 to 15, Pr.85, Pr.86, Pr.565, Pr.566, Pr.617)<br>• Motor induced voltage constant (Pr.1412, Pr.1413)<br>• Load characteristics fault detection (Pr.1480 to Pr.1492)<br>• Input signals (CLRN, JOGF, JOGR)<br>Edited<br>• 7.1 Rating |
| Feb. 2019 | IB-0600562ENG-E | Added<br>• Application of caution labels<br>• Droop control using the per-unit speed control reference frequency (Pr.288 (Pr.681) = "20 to 22")<br>• Torque current command limit (Pr.803 = "2")<br>• PID manipulated amount: 0 to 100% (Pr.1015 = "2, 12")<br>• Pr.1348 P/PI control switchover frequency<br>• Pr.1349 Emergency stop operation selection<br>• Operation selection at a communication error (Pr.502 = "11, 12")<br>• External fault during output operation<br>• Pr.275 setting range: 0 to 300%<br>• Reset selection/disconnected PU detection/PU stop selection (Pr.75 = "1000 to 1003, 1014 to 1017, 1100 to 1103, 1114 to 1117")<br>• External fault input signal (Pr.178 to Pr.189 = "32")<br>• PLC function (Pr.414 ="11, 12", Pr.675)<br>• Pulse monitor selection (Pr.430 = "2000 to 2005, 2012, 2013, 2100 to 2105, 2112, 2113, 3000 to 3005, 3012, 3013, 3100 to 3105, 3112, 3113")<br>• Monitor with sign selection (Pr.1018 = "1")<br>• Automatic restart after instantaneous power failure selection (Pr.162 = "1000 to 1003, 1010 to 1013")<br>• Position command source selection (Pr.419 ="200, 210, 300, 310, 1310") |
| Aug. 2021 | IB-0600562ENG-F | Added<br>• Main circuit capacitor life measurement at power OFF (every time) (Pr.259 = "11")<br>• Pr.506 Display estimated main circuit capacitor residual life<br>• Current input check terminal selection (Pr.573 = "11 to 14, 21 to 24")<br>• Low-speed forward rotation command (RLF) signal, Low-speed reverse rotation command (RLR) signal (Pr.178 to Pr.189 = "128, 129")<br>• Vector control for PM motor with encoder supported (Pr.373, Pr.871, Pr.887, Pr.1105)<br>• Cooling fan operation selection during the test operation (Pr.244 = "1000, 1001, 1101 to 1105")<br>• Display/reset ABC relay contact life (Pr.507, Pr.508)<br>• Emergency drive (Pr.514, Pr.515, Pr.523, Pr.524, Pr.1013, Pr.178 to Pr.189 = "84", Pr.190 to Pr.196 = "65, 66")<br>Edited<br>• Chapters deleted (6 TROUBLESHOOTING, 7 SPECIFICATIONS)<br>• Tightening torque specifications |
| | | |

# FR-A800/A800 Plus Series
## Instruction Manual Supplement

# 1 Earth (ground) fault detection at start / restricting reset method for an earth (ground) fault

The reset method for the output side earth (ground) fault overcurrent (E.GF) can be restricted.

- Select whether to enable or disable the earth (ground) fault detection at start. When enabled, the earth (ground) fault detection is performed immediately after a start signal input to the inverter.
- Select whether to restrict the reset method for an earth (ground) fault.

| Pr. | Name | Initial value | Setting range | Description | |
|---|---|---|---|---|---|
| | | | | Earth (ground) fault | Reset method |
| **249**<br>**H101** | **Earth (ground) fault detection at start** | 0 | 0 | Not detected at start | Not restricted |
| | | | 1 | Detected at start | |
| | | | 2 | | Restricted |

## ◆ Selecting whether to perform the earth (ground) fault detection at start V/F Magnetic flux

- If an earth (ground) fault is detected at start while **Pr.249** = "1 or 2", the output side earth (ground) fault overcurrent (E.GF) is detected and output is shut off.
- Earth (ground) fault detection at start is enabled under V/F control and Advanced magnetic flux vector control.
- When the **Pr.72 PWM frequency selection** setting is high, enable the earth (ground) fault detection at start.

**NOTE**

- Because the detection is performed at start, output is delayed for approx. 20 ms every start.
- Use **Pr.249** to enable/disable the earth (ground) fault detection at start. During operation, earth (ground) faults are detected regardless of the **Pr.249** setting.

## ◆ Restricting reset method for an earth (ground) fault

- The reset method when the output is shut off due to the output side earth (ground) fault overcurrent (E.GF) can be restricted. When E.GF occurs while **Pr.249** = "2", E.GF can be reset only by turning OFF the control circuit power.
- This restriction prevents the inverter from being damaged due to repeated reset operations by the other methods such as entering the RES signal.
- When E.GF occurs while **Pr.249** = "2", the output short-circuit detection (ALM4) signal can be output.
- For the terminal used to output the ALM4 signal, set "23" (positive logic) or "123" (negative logic) in any of **Pr.190 to Pr.196 (Output terminal function selection)**.
- If **Pr.249** is set to "2" while the retry function is enabled (**Pr.67** is not set to "0"), no retry is performed even when E.GF occurs.
- If **Pr.249** is set to "2" while the automatic bypass switching after inverter fault is enabled (**Pr.138** is not set to "1"), the operation is not switched to the commercial power supply operation even when E.GF occurs.

**NOTE**

- Changing the terminal assignment using **Pr.190 to Pr.196 (Output terminal function selection)** may affect the other functions. Set parameters after confirming the function of each terminal.
- E.GF is not cleared by turning ON the Fault clear (X51) signal when **Pr.249** = "2".
- If E.GF occurs during emergency drive operation when **Pr.249** = "2", the output is shut off.

# 2 Output short-circuit fault (E.SCF)

Select the reset operation and fault indication for an output short-circuit.

| Pr. | Name | Initial value | Setting range | Description | |
|---|---|---|---|---|---|
| | | | | Operation after detection | Reset method |
| **521**<br>**H194** | **Output short-circuit detection** | 0 | 0 | E.OC1 to E.OC3 | Not restricted |
| | | | 1 | E.SCF | Restricted |

- The fault indication for an output short-circuit (E.OC1 to E.OC3, and E.SCF) can be changed by the **Pr.521** setting.
- When an output short-circuit is detected while **Pr.521** = "1", E.SCF is displayed and the inverter output is shut off.
- When E.SCF occurs while **Pr.521** = "1", E.SCF can be reset only by turning OFF the control circuit power. (E.OC1 to E.OC3 can be reset by any reset method.)
- This restriction prevents the inverter from being damaged due to repeated reset operations by the other methods such as entering the RES signal.
- When E.SCF occurs, the output short-circuit detection (ALM4) signal can be output.
- For the terminal used to output the ALM4 signal, set "23" (positive logic) or "123" (negative logic) in any of **Pr.190 to Pr.196 (Output terminal function selection)**.
- If the automatic bypass switching after inverter fault is enabled (**Pr.138** is not set to "1"), the operation is not switched to the commercial power supply operation even when E.SCF occurs.

| **Operation panel indication** | **E.SCF** | E. SCF | **FR-LU08 indication** | **Fault** |
|---|---|---|---|---|
| **Name** | Output short-circuit fault | | | |
| **Description** | The inverter output is shut off when an output short-circuit is detected while **Pr.521** = "1". When **Pr.521** = "0" (initial value), E.OC1, E.OC2, or E.OC3 appears when an output short-circuit is detected. | | | |
| **Check point** | Check for output short-circuit. | | | |
| **Corrective action** | Check the wiring to make sure that any output short circuit does not occur, then turn OFF the control circuit power to reset the inverter. | | | |

**NOTE**

- When short-circuit resistance is large, the current does not reach the short-circuit detection level. In such a case, an output short-circuit cannot be detected.
- Changing the terminal assignment using **Pr.190 to Pr.196 (Output terminal function selection)** may affect the other functions. Set parameters after confirming the function of each terminal.
- E.SCF does not activate the retry function.
- E.SCF is not cleared by turning ON the Fault clear (X51) signal.
- If E.SCF occurs during emergency drive operation, the output is shut off.
- The communication data code for E.SCF is 20 (H14).

# 3 Extended detection time of the output current and zero current

The setting range of the **Pr.151 Output current detection signal delay time** and **Pr.153 Zero current detection time** is extended.

| Pr. | Name | Initial value | Setting range | Description |
|---|---|---|---|---|
| **151**<br>**M461** | **Output current detection signal delay time** | 0 s | 0 to 300 s | Set the output current detection time. Enter the time from when the output current reaches the set current or higher to when the Output current detection (Y12) signal is output. |
| **153**<br>**M463** | **Zero current detection time** | 0.5 s | 0 to 300 s | Set the time from when the output current drops to the **Pr.152** setting or lower to when the Zero current detection (Y13) signal is output. |

# 4 Selecting the command interface in the Network operation mode (Pr.338, Pr.339)

- The proximity dog (X76) signal can be input via communication.
- The following table shows the command interface for the function in the Network operation mode, determined by the parameter settings: an external terminal or a communication interface (RS-485 terminals or communication option).

| Pr.338 Communication operation command source | | 0: NET | | | 1: EXT | | |
|---|---|---|---|---|---|---|---|
| Pr.339 Communication speed command source | | 0: NET | 1: EXT | 2: EXT | 0: NET | 1: EXT | 2: EXT |
| X76 | Proximity dog | Combined | | | EXT | | |

[Explanation of Terms in Table]
EXT: External terminal only
Combined: Either external terminal or communication interface

# FR-A860
# Instruction Manual Supplement

## 1 Instructions for UL and cUL

(Standard to comply with: UL 61800-5-1, CSA C22.2 No. 274)

### ◆ Applicable models

- FR-A860-00027 to 04420
- The above models are compliant with both UL 508C and UL 61800-5-1, CSA C22.2 No. 274. (The FR-A860-00090 or less is not compliant with UL 508C.)
  For the instructions for UL 61800-5-1, CSA C22.2 No. 274, refer to this Instruction Manual Supplement.
  For the instructions for UL 508C, refer to the FR-A860 (600V CLASS SPECIFICATION INVERTER) INSTRUCTION MANUAL (STARTUP).

### ◆ Product handling information / Informations sur la manipulation du produit

-WARNING- Operation of this product requires detailed installation and operation instructions provided in the Instruction Manual (Startup) and the Instruction Manual (Detailed) intended for use with this product. Please forward relevant manuals to the end user.

-AVERTISSEMENT-
L'utilisation de ce produit nécessite des instructions détaillées d'installation et d'utilisation fournies dans les manuels d'instructions en anglais (Instruction Manual (Startup) et Instruction Manual (Detailed)) destinés à être utilisés avec ce produit. Veuillez transmettre les manuels correspondants à l'utilisateur final.

### ◆ Precautions for compliance with CSA C22.2 No.274

Use the inverter under the conditions of overvoltage category III and pollution degree 2 or lower specified in IEC 60664.

### ◆ Branch circuit protection

For installation in the United States, branch circuit protection must be provided in accordance with the National Electrical Code and any applicable provincial codes.
For installation in Canada, branch circuit protection must be provided in accordance with the Canadian Electrical Code and any applicable provincial codes. Short circuit protection of the inverter cannot be used as branch circuit protection. Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the National Electrical Code and any additional local code.

#### ■ Precautions for opening the branch-circuit protective device / Précautions pour ouvrir le dispositif de protection du circuit de dérivation

-WARNING- If the fuse melts down or the breaker trips on the input side of this product, check for wiring faults (such as short circuits). Identify and remove the cause of melting down or the trip before replacing the fuse or resetting the tripped breaker (or before applying the power to the inverter again).
-AVERTISSEMENT-
Si le fusible fond ou si le disjoncteur se déclenche du côté entrée de ce produit, vérifier les défauts de câblage (tels que les courts-circuits). Identifier et éliminer la cause de la fonte ou du déclenchement avant de remplacer le fusible ou de réinitialiser le disjoncteur déclenché (ou avant de remettre sous tension l'onduleur).

## ■ Fuse selection

Fuses are selected based on IEC/EN/UL 61800-5-1 and CSA C22.2 No. 274.

For installation in the United States, the following semi-conductor fuses must be provided, in accordance with the National Electrical Code and any applicable local codes. For installation in Canada, the following semi-conductor fuses must be provided, in accordance with the Canada Electrical Code and any applicable provincial codes. Always install the following semiconductor fuses for branch circuit protection.

| Inverter Model | Cat. No. | Manufacturer | Rating (A) |
|---|---|---|---|
| FR-A860-00027 | BS000GB69V20 | Mersen | 20 |
| FR-A860-00061 | BS000GB69V25 | Mersen | 25 |
| FR-A860-00090 | BS000GB69V32 | Mersen | 32 |
| FR-A860-00170 | BS000GB69V63 | Mersen | 63 |
| FR-A860-00320 | BS000GB69V100 | Mersen | 100 |
| FR-A860-00450 | BS000UB69V125 | Mersen | 125 |
| FR-A860-00680 | BS000UB69V160 | Mersen | 160 |
| FR-A860-01080 | PC30UD69V250TF | Mersen | 250 |
| FR-A860-01440 | PC30UD69V315TF | Mersen | 315 |
| FR-A860-01670 | PC30UD69V315TF | Mersen | 315 |
| FR-A860-02430 | PC31UD69V350TF | Mersen | 350 |
| FR-A860-02890 | PC31UD69V400TF | Mersen | 400 |
| FR-A860-03360 | PC31UD69V500TF | Mersen | 500 |
| FR-A860-04420 | PC33UD69V700TF | Mersen | 700 |

# ◆ Capacitor discharge time / Temps de décharge du condensateur

CAUTION -Risk of Electric Shock-

Before wiring or inspection, check that the LED indicator turns OFF. Any person who is involved in wiring or inspection shall wait for 10 minutes or longer after power OFF and check that there are no residual voltage using a digital multimeter or the like. The capacitor is charged with high voltage for some time after power OFF, and it is dangerous.

ATTENTION -Risque de choc électrique-

Avant le câblage ou l’inspection, vérifier que le témoin LED s’éteint. Toute personne impliquée dans le câblage ou l’inspection doit attendre 10 minutes ou plus après la mise hors tension et vérifier l’absence de tension résiduelle à l’aide d’un multimètre numérique ou similaire. Le condensateur est chargé avec une haute tension pendant un certain temps après la mise hors tension, ce qui est dangereux. Précautions pour ouvrir le dispositif de protection du circuit de dérivation.

# ◆ Wiring to the power supply and the motor

- Refer to the National Electrical Code (Article 310) regarding the allowable current of the cable. Select the cable size for 125% of the rated current according to the National Electrical Code (Article 430). For wiring the input (R/L1, S/L2, T/L3) and output (U, V, W) terminals of the inverter, use the UL listed copper, stranded wires (rated at 75°C) and round crimp terminals. Crimp the terminals with the crimping tool recommended by the terminal manufacturer.

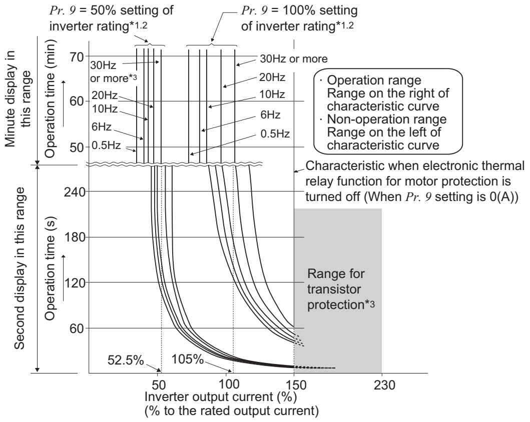
# ◆ Short circuit ratings

- Suitable for use in a circuit capable of delivering not more than 100 kA rms symmetrical amperes, 600 V maximum.

## ◆ Motor overload protection

When using the electronic thermal relay function as motor overload protection, set the rated motor current in **Pr.9 Electronic thermal O/L relay**.

Operation characteristics of electronic thermal relay function




This function detects the overload (overheat) of the motor, stops the operation of the inverter's output transistor, and stops the output. (The operation characteristic is shown on the left.)

*1 When a value 50% of the inverter rated output current (current value) is set in **Pr.9**

*2 The % value denotes the percentage to the inverter rated current. It is not the percentage to the rated motor current.

*3 Transistor protection is activated depending on the temperature of the heat sink. The protection may be activated even with less than 150% depending on the operating conditions.

**NOTE**

- The internal accumulated heat value of the electronic thermal relay function is reset by inverter power reset and reset signal input. Avoid unnecessary reset and power-OFF.
- When multiple motors are driven with a single inverter or when a multi-pole motor or a special motor is driven, install an external thermal relay (OCR) between the inverter and motors. Note that the current indicated on the motor rating plate is affected by the line-to-line leakage current (details in the Instruction Manual (Detailed)) when selecting the setting for an external thermal relay.
- The cooling effect of the motor drops during low-speed operation. Use a thermal protector or a motor with built-in thermistor.
- When the difference between the inverter and motor capacities is large and the setting is small, the protective characteristics of the electronic thermal relay function will be deteriorated. In this case, use an external thermal relay.
- A special motor cannot be protected by the electronic thermal relay function. Use an external thermal relay.
- Motor over temperature sensing is not provided by the drive.

## ◆ Applicable power supply

For use at an altitude above 2000 m (maximum 2500 m), only a neutral-point earthed (grounded) power supply can be used.

MEMO

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